Welfare and the incentive to work: the Alberta case

J.F.D. Rowlatt

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Foreword

Opportunity, social and economic, is essential to human development. Since its inception, therefore, the Human Resources Research Council has concerned itself with the study of social and economic opportunities available to Albertans. Inevitably, such studies involve the investigators in the economic, political, legal, social, and educational life of the community.

In April, 1969, the Council sponsored a major Symposium on Social Opportunity. Working papers were presented by 40 scholars from the three Alberta universities. The papers covered inequalities of opportunity in such areas as law, politics, health, education, and economics.

Following the symposium six major areas were identified as important for intensive study and research: political opportunity, the economics of educational opportunity, employment opportunity, health opportunity, the opportunity of equality before the law, and economic opportunity. Studies in these areas became the responsibility of HRRC's Socio-Economic Oportunity Studies unit.

J. D. Rowlatt's study on the economics of the welfare system in Alberta and Canada, which has resulted in WELFARE AND THE INCENTIVE TO WORK: THE ALBERTA CASE, was initiated under the direction of Dr. K. Krotki, then Coordinator of HRRC's Socio-Economic Opportunity Studies unit. The completed report was first received in September, 1971.

The study has been completed under the direction of Dr. J. MacMillan, Associate Director of HRRC in charge of the Socio-Economic Studies unit. The manuscript was prepared for printing by the staff of HRRC's User Services unit.

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J. Donald Rowlatt
Saskatoon, Saskatchewan
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Chapter I

Introduction

There is a growing awareness in Canada that the present social assistance system is inadequate and must be reorganized. The push for change comes from a number of directions. To those concerned with eliminating poverty, the present structure is inadequate, since many poor people are not eligible for assistance and many of the recipients do not receive enough assistance to meet the necessities of life. To those concerned with rapidly growing welfare costs and the impact of taxes, the fault lies in the likelihood that the availability of welfare under the present scheme reduces the incentive to work.

In response to demands for improvement of the welfare system, the Department of National Health and Welfare has proposed changes to broaden the coverage of the present system and remove some of the work disincentives presently written into welfare legislation, by altering the exemptions on earned income.[1] Broad adaptation of a guaranteed income program was not recommended for use among people normally in the labor force. At present, the "fear of its impact on productivity" prevents the adoption of a guaranteed income plan. The report of the Department of National Health and Welfare suggests that research on the effect of a guaranteed income on personal motivation is needed before such a plan can be instituted among the potentially employed. The report fails to note that the results of the expansion of the present system and the introduction of work incentives into the current regulations depend as much on people's responses as would the results of implementing a guaranteed income. It is true that very little research has been done in Canada on the response of low income people to changes in the welfare regulations. However, the impact of any policy change, not just of the move to a guaranteed income, will be uncertain until such research is completed.

The total impact on work incentives of a change in welfare regulations depends on the labor supply response of two groups of potential members of the labor force. The work-leisure choice of a new set of people will be affected if the coverage of the social assistance system is expanded. More of the working poor will either automatically be able to receive assistance or will be eligible to apply for help. In addition, people already receiving assistance will face different conditions in the choice between work or welfare. These recipients will be eligible for higher welfare payments than they presently receive and will also be provided with greater incentives to get a job. The work behavior of both the new and the old recipients must be predicted if we are to foresee the impact of a change in the welfare regulations. For example, let us suppose that the present welfare system is expanded so that higher benefits are paid and so that income earned by the recipients is taxed at a lower rate than under the current welfare regulations. To receive assistance, an individual would still be required to apply to the welfare agency and pass all the requirements.

Static labor supply theory predicts that the work effort of the newly eligible welfare recipients will decrease.[2] Three factors will alter the work behavior of an individual who had not previously been eligible for assistance. First, welfare payments make the recipient wealthier no matter how many hours he works. This increase in wealth produces an income effect away from work by encouraging the consumption of leisure. Second, the income earned while on welfare will be taxed at a higher rate than before, although not at 100 per cent, inducing the recipient to substitute leisure for work, since the price of leisure has fallen. Third, since he experiences a lower after-tax wage rate, he will earn less income for a given amount of work effort, and there will be an income effect in the direction of more work coupled with the drop in the after-tax wage rate. In total, the amount of work effort must fall since the subsidy provided will be greater than the drop in income due to the after-tax wage change, and the price of leisure has fallen.

The response of welfare recipients to changes in welfare statutes is ambiguous. An increase in the level of benefits would produce an income effect, reducing the willingness to work. Since the after-tax wage rate would be increased by a reduction in the tax rate on earned income, the recipients would substitute towards work and away from leisure. At a higher wage rate, at any level of work effect, the recipient would have more income and would choose to consume more leisure and reduce his work effort. The substitution effect operates towards more work, and the two-income effects encourage less work. This research provides, on the basis of an analysis of the Alberta welfare system, empirical evidence to assist in answering the question of whether current recipients work more or less under revised welfare statutes.

The Alberta Welfare System and the Data

To qualify for welfare in Alberta, an individual must take a needs, or budget deficit, test, which determines his eligibility by comparing his assets and income with his budgetary requirements. Budgetary require-

ments are determined on the basis of standard and rate scales related to studies of budgetary needs and/or actual costs to the particular recipients. Such items as clothing, food, and personal allowances are determined by the size and composition of the family. Other funds are budgeted to meet the actual costs of housing and utilities. Additional allowances for items such as telephone or transportation are budgeted only under special circumstances.

If, according to the needs test, an individual requires assistance, he need not pass any other categorical requirements. Once granted assistance, however, the individual will be classified for administrative purposes into one of the following categories:

(i) Age
(ii) Physical Ill Health
(iii) Mental Ill Health
(iv) Employed, Insufficient Income
(v) Mother with Dependent Child(ren)
(vi) Father with Dependent Child(ren)
(vii) Guardian Social Allowance with Relatives
(viii) Guardian Social Allowance with non-Relatives
(ix) Unemployed Employables

This study used samples from the employed, insufficient income, mother with dependent child(ren), and unemployed employable categories. The samples were selected because individuals in the other categories are not generally considered to be either active or potential members of the labor force. (The category, "father with dependent child(ren)," was excluded from the analysis because it contained too few observations.) Random samples were taken from cases in the three categories in September, 1969 and January, 1970. The sample of employed, insufficient income recipients was divided so that fully employed and partly employed recipients could be analyzed separately. The September and January cases were then combined to provide four samples for analysis. Table 1-1 shows the size of each sample.

The data are collected monthly by the Alberta Department of Social Development. A case history is taken of each client interviewed by a social worker before he can receive welfare. The case history, with any change in the conditions each month, is recorded by the social worker on a coded sheet. The data are sent to the central office in Edmonton, and a master tape with the data from all the branch offices is compiled.

The samples used in this study were acquired by random process from the master tape, and information was recorded on the following characteristics:

(i) Location of residence
(ii) Budgetary requirements
(iii) Income from other sources
(iv) Amount of subsidy
(v) Number of months the recipient has been on welfare
(vi) Educational status
(vii) Type of skill
(viii) Occupation
(ix) Type and quality of housing
(x) Racial origin
(xi) Age
(xii) Sex
(xiii) Number of adults in the case
(xiv) Number and age of children
(xv) Marital status

The quality of the data depends on the accuracy of the caseworkers in completing the data sheets.

TABLE 1-1:
Size of the Samples in the Four Categories
(Number of Cases)

	September 1969	January 1970	Combined Sample
Fully employed recipients	384	366	750
Partly employed recipients	414	451	865
Mothers with dependent child(ren)	542	533	1,075
Unemployed employables	521	527	1,048

Fortunately, most of the characteristics are well-defined. The housing data probably suffers the most from a lack of clear-cut guidelines.

Objectives

This study analyzes a group of Alberta welfare recipients currently receiving assistance, to see if their work effort is consistent with traditional labor supply theory. If recipients respond according to the predictions of a labor supply model, and if we can estimate the relative sizes of the income and substitution effects, we can more easily predict the response of the current welfare population to the introduction of a guaranteed income plan or an altered and expanded version of the present plan.

Before such analysis can proceed, it is necessary to look at the present system to determine whether the statutes set down by the government are being enforced. In particular, I question whether the tax rate on earned income is actually 100 per cent. If benefits are reduced by one dollar for each dollar earned, it is difficult to understand why so many welfare recipients work either part time or full time.[3]

In Chapter II, the actual tax rate applied to earned income is estimated and compared with the statutory rate. Chapters III and IV analyze the length of the time the recipients have been on welfare to see if their behavior is consistent with the predictions from a labor supply model. Chapter V summarizes the results.

Chapter II

An Estimate of the Welfare Tax Rate

The levying of an income tax reduces the take-home pay from any job. The higher the tax rate the lower the ratio of spendable income to earned income during each period of work. If the marginal tax rate on earnings were 100 per cent, an individual could not increase his spendable income by working. Unless work has some other intrinsic value, working under such conditions is irrational. It is often argued[1] that these conditions prevail in the majority of the welfare systems in North America. Although welfare recipients are not actually required to turn their earned income over to the welfare agencies, most systems require that welfare payments be reduced by an amount equal to any outside income.[2] Such circumstances are identical to the imposition of a 100 per cent income tax on earned income.

Given a statutory 100 per cent tax rate, it becomes difficult to explain why many welfare recipients choose to work. Some recipients hold part-time jobs and a number even elect to work full time. One explanation of such behavior is that the *actual* tax rate effective in these systems is significantly lower than the statutory rate.[3] If the rate effected by the welfare system is actually less than 100 per cent, recipients could increase their spendable income by working.

In direct reference to the level of welfare tax rates, Heffernan claims that "pro-recipient" supervisors and caseworkers can easily locate means of exempting earned income from taxation.[4] Caseworkers can substantially reduce the marginal tax rates in effect by claiming all possible expenses in the calculation of family requirements, even if the expenses are not actually incurred.

This chapter contains estimates of the tax rate actually in effect in the Alberta welfare system, which has a statutory 100 per cent tax rate on earned income. As in most income tax calculations, a small amount of earned income is exempted from the tax calculations. The tax rate on the taxable portion of the earned income should, according to the statutory rates, be 100 per cent. The model to be estimated is presented in Part I, while data and empirical results are presented in Part II. Part III discusses potential bias in the estimates and Part IV is a summary and conclusion.

Conceptual Framework

The purpose of any welfare system is to provide a minimum income to any family with no income of its own, or to supplement the income of families with inadequate earned income.[5] A subsidy, either in kind, by voucher, or by cheque is provided to make up the difference between an individual's earned income, Y_e, and his total basic requirement as calculated by a caseworker.

The spendable income available to a welfare recipient, Y, can be specified by the following relationship:

$$Y = G + (1-t)[Y_e - R] + R \qquad (2.1)$$

$$\text{for } [Y_e - R] > 0$$

$$Y = G + Y_e \qquad (2.1a)$$

$$\text{for } [Y_e - R] \leqq 0$$

where

G = the amount of income guaranteed to the recipient even if $Y_e = 0$. The income guaranteed to any recipient will presumably depend on the size and structure of the family and on the allowance made for shelter.

R = the amount of earned income that is exempted from taxation.

t = the rate at which the subsidy is reduced for each dollar of earned income. It represents the marginal tax rate in the system, since it determines how spendable income varies with changes in the taxable earned income.

The subsidy (S) provided to the recipient which makes up the difference between Y_e and Y, can be described as:

$$S = G - t[Y_e - R] \qquad (2.2)$$

$$\text{for } [Y_e - R] > 0$$

$$S = G$$

$$\text{for } [Y_e - R] \leqq 0 \qquad (2.2a)$$

The level of earned income beyond which a recipient no longer qualifies for a subsidy can be identified by setting (2.2) at zero. This point is defined by:

$$Y_e^* = \frac{G + tR}{t} \qquad (2.3)$$

where Y_e^* is the break-even level of earned income.

In any welfare system with a 100 per cent tax rate on earned income (t = 1), the break-even point occurs where earned income is equal to the income guaranteed plus the amount of income not subject to taxation.[6]

As is clear from equation (2.1), the spendable

income available to any recipient can be substantially greater than the amount guaranteed at $Y_e = 0$ only if the tax rate, t, is significantly less than unity. The following specifications of t permit the value to be either unity, significantly different from unity but still a constant, or different from unity and a variable over levels of taxable earned income.

$$t = t_0 \qquad (2.4)$$

$$t = t_0 + t_1 [Y_e - R] + t_2 [Y_e - R]^2 \qquad (2.4a)$$

A measure of the marginal tax rate effective in a welfare system can be derived by estimating equation (2.1) on the assumption that the form of t is specified in (2.4) or (2.4a). Part II contains estimates of t using this procedure.

Empirical Results

1. DATA

Estimates of the effective tax rate paid by the four groups of welfare recipients will be presented. In the unemployed employable and mother with dependent child(ren) categories, the mean value of earned income is very low. In fact, most recipients in these categories do not have any earned income, although a few have substantial amounts of earned income. There are, however, sufficient observations over the range of Y_e to facilitate the identification of a relationship between Y_e and Y. The samples include information on total income, Y, earned income, Y_e, and family size and composition, but not on the actual housing expenditures. However, information about the type and quality of housing and the location of residence is presented and these data can be used to estimate the actual housing costs. Data on actual housing costs are available for a small sample taken in May, 1970 and this sample can be used to examine the bias in the estimating procedure.

All income and cost figures are on a per month basis. The maximum earned income exempted from taxation is $25.00 per month, giving R a maximum value of $25.00. Means for some of the important variables are presented in Table 2-1.

2. SPECIFIC VARIABLES USED IN THE EMPIRICAL TESTS

Letting Y_{TAX} represent taxable earned income and combining (2.1) and (2.1a) gives:

$$Y = G + (1-t)Y_{TAX} + R \qquad (2.5)$$

where

$$Y_{TAX} = [Y_e - 25.00] \quad \text{if } Y_e > 25.00$$
$$= [0] \quad \text{if } Y_e < 25.00$$

$$R = [25.00] \quad \text{if } Y_e > 25.00$$
$$= [Y_e] \quad \text{if } Y_e < 25.00$$

The amount of income guaranteed each recipient, G, should, according to the statutes,[7] depend on family size and structure and actual housing expenditures. The following variables are included in the equation to estimate G for each recipient.[8]

(a) SEX-ADULT VARIABLE

Families with two adult members should receive more welfare money than families with one. The use of only one variable produced peculiar results for the fully employed and partly employed samples, so a set of dummy regressors accounting for the sex of the head of each family unit and the number of adults in the family was entered. This variable will also pick up any differences in housing costs paid by male and female family heads. For the other two samples, one variable, two adults, was adequate.

TABLE 2-1:
Means of Income and Family Size Variables for the Four Samples of Welfare Cases

	Fully Employed	Partly Employed	Unemployable	Mother with Dependent Child(ren)
Y	$365.82	$277.75	$193.08	$246.00
Y_e	$265.11	$104.65	$ 13.09	$ 20.83
Number of Adults	1.37	1.55	1.65	1.01
Number of Children	3.47	3.12	2.04	2.71

(b) LOCATION

Whether a recipient lives in a city, town, hamlet, or rural area will significantly influence the housing costs. Rents and all other tax and utility costs are high in the cities and lower in the less populated centers.

(c) TYPE OF HOUSING

A set of seven dummy regressors describes the type of housing maintained. This variable will assist in estimating housing costs since, for example, renting a single family dwelling is more expensive than renting a room in an apartment house.

(d) QUALITY OF HOUSING

Caseworkers are required to visit the home of each recipient and to rate the accommodation as above standard, standard, or below standard. Because the term "standard" is not defined, this variable will permit subjective factors to enter the analysis. Nevertheless, since housing quality influences the cost, this variable should assist in the prediction of actual housing expenses.

(e) NUMBER AND AGE OF CHILDREN

The food and clothing allowance permitted for each child is specified by the regulations. The amount of the allowance depends upon the age of the child. To account for the influence of both the number of children and the age of the children, variables recording the number of children in each of three age categories are included in the regressions.

(f) "MONTHDUM"

Any increase in costs between September, 1969 and January, 1970 will be absorbed by this variable. Expenses for heating or clothing are likely to be greater in January than in September. "Monthdum" has the value of zero for cases from the September, 1969 sample and of one for cases from the January, 1970 sample.

The relationship between G and the variables listed above can be written as:

$$G = G(X_i) \qquad (2.6)$$

where X_i is the group of variables defining the guarantee level. Substituting equations (2.4), (2.4a) and (2.6) into equation (2.5) gives the two alternative equations for estimation corresponding to the two assumptions about tax rates:

$$Y = C + \alpha_i X_i + \beta Y_{TAX} + \gamma R + \varepsilon \qquad (2.7)$$

$$Y = C + \alpha_i X_i + \beta_1 Y_{TAX} + \beta_2 Y_{TAX}^2 + \beta_3 Y_{TAX}^3 + \gamma R + \varepsilon \qquad (2.7a)$$

From (2.5), it is obvious that

$$\frac{\partial Y}{\partial Y_{TAX}} = (1-t)$$

Estimates for the actual tax rate, t, derived from (2.7) and (2.7a) are:

$$t = 1 - \beta \qquad (2.8)$$

$$t = 1 - \beta_1 - 2\beta_2 Y_{TAX} - 3\beta_3 Y_{TAX}2 \qquad (2.8a)$$

3. REGRESSION RESULTS

Tables 2-2 to 2-5 present the regression results for the four samples. Two specifications were estimated for each sample. Column A in each table presents the results of estimating equation (2.7a) and Column B the results of estimating equation (2.7).[9] The t-values are shown in parentheses.

(a) FULLY EMPLOYED SAMPLE

Most of the coefficients contained in Table 2-2 are of the expected sign and are clearly significantly different from zero. Only a few of the control variables generate unexpected results. The coefficients on the sex-adult variables suggest that male-one-adult cases receive more income than either female-one-adult or male-two-adult cases. There were no two-adult families headed by females in the sample. A few peculiar cases could generate this result, since male-one-adult cases comprise only 3.6 per cent of the sample. The coefficients are consistent with the possibility that male recipients with no spouse pay high rents relative to the other recipients.

The coefficients on the number of children variables from the sample of fully employed recipients are positive and very significant, but they do not indicate that older children receive a larger food and clothing grant. The expected pattern is illustrated by the coefficients from the sample of partly employed recipients.

The coefficients on the Y_{TAX} variables are significantly different from zero. In other words, the level of earned income significantly influences the amount of spendable income available to the recipients. Using equations (2.8) and (2.8a), the marginal tax rate is significantly different from 100 per cent when the tax rate is estimated either as a constant or as a variable. When constrained to be a constant, the marginal tax rate faced by the fully employed recipients was estimated at 53 per cent. Figure 2.1 illustrates how the marginal tax rate varies with taxable earned income, Y_{TAX}. The solid line describes t, the marginal tax rate, at each level of Y_{TAX} and the dotted lines illustrate a 95 per cent confidence band around the estimated tax rate.

(b) PARTLY EMPLOYED SAMPLE

Table 2-3 presents the regression coefficients for the sample of partly employed recipients. Most of the coefficients on the control variables are of the expected sign and magnitude. The only problem is that the costs of room and board appear to be significantly less than the maintenance costs of a house owned by the recipient. Since the room and board category includes only a small percentage of the sample, a low average cost could be observed if some of the recipients live with friends or relatives who charge less than the real costs of room and board.

The welfare tax rate, as estimated from the coefficients on the Y_{TAX} variables, is significantly different from 100 per cent. When constrained to be a constant, the marginal tax rate paid by this group of recipients is 67 per cent. Figure 2.2 illustrates that the tax rate, when introduced as a variable, differs significantly from 100 per cent over the entire range of Y_{TAX}.

(C) UNEMPLOYED EMPLOYABLE SAMPLE

The results for this sample are presented in Table 2-4. The only problem with the coefficients on the control variables is that children between six and twelve appear to receive the same allowance as older children.

The actual marginal tax rate, when specified as a constant, is about 76 per cent and is significantly different from 100 per cent since the coefficient on Y_{TAX} in Column B is significantly different from zero. Figure 2.3 indicates that the marginal tax rate is significantly less than 100 per cent for recipients with Y_{TAX} greater than $100 per month. About six per cent of the unemployed employable recipients have Y_{TAX} in this range while only about twelve per cent have any income at all.

(d) MOTHER WITH DEPENDENT CHILD(REN) SAMPLE

Table 2-5 presents the regression results for this sample. None of the coefficients on the control variables differ substantially from the expected results.

The marginal tax rate is estimated at about 75 per cent and is significantly less than 100 per cent. When introduced as a variable, the marginal tax rate is significantly less than 100 per cent at all but the smallest levels of Y_{TAX}. This relationship is presented in Figure 2.4.

TABLE 2-2:

Spendable Income Equation for Fully Employed Welfare Recipients

	Dependent Variable =	Total Spendable Income Per Month
Independent Variables	*A*	*B*
Constant	89.44	111.48
	(3.73)	(8.67)
Sex-Adult		
Female, 1 Adult	Omitted	Omitted
Male, 1 Adult	52.61	51.78
	(4.60)	(4.54)
Male, 2 Adult	1.02	2.02
	(.18)	(.36)
Location		
City	Omitted	Omitted
Town	-18.40	-18.96
	(3.00)	(3.05)
Hamlet	-45.06	-44.62
	(3.60)	(3.51)
Rural Area	-47.78	-45.68
	(5.10)	(4.80)
Type of Housing		
Rented Room	28.97	30.33
	(.72)	(.74)
Rented Suite	54.07	55.02
	(4.68)	(4.67)
Rented, Single Dwelling	57.58	58.53
	(5.29)	(5.30)
Own-Hold Title	Omitted	Omitted
Own-Mortgage	48.30	50.62
	(4.09)	(4.22)
Squatter	5.04	7.07
	(.20)	(.28)
Room and Board	4.66	11.58
	(.23)	(.55)
Quality of Housing		
Above Standard	21.64	27.42
	(2.19)	(2.74)
Standard	Omitted	Omitted
Below Standard	-9.05	-6.47
	(1.21)	(.85)
Number of Children		
Age 1-5	26.12	26.15
	(9.89)	(9.75)
Age 6-12	27.02	27.00
	(16.12)	(15.93)
Age 13 Plus	24.43	23.61
	(12.68)	(12.21)
MONTHDUM	8.70	8.48
	(2.15)	(2.07)
R	Omitted	Omitted
Y_{TAX}	1.10345	.46593
	(3.92)	(15.89)
Y_{TAX}^2	-.003692	
	(3.92)	
Y_{TAX}^3	.00000569	
	(3.70)	
R^2	.7255	.7159
Number of Observations	750	750

TABLE 2-3:

Spendable Income Equation for Partly Employed Welfare Recipients

	Dependent Variable =	Total Spendable Income Per Month
Independent Variables	*A*	*B*
Constant	149.53	149.13
	(18.07)	(18.01)
Sex-Adult		
Female, 1 Adult	Omitted	Omitted
Male, 1 Adult	-13.38	-12.21
	(1.51)	(1.38)
Male, 2 Adults	23.21	23.89
	(4.76)	(4.91)
Location		
City	Omitted	Omitted
Town	-40.78	-40.94
	(7.10)	(7.12)
Hamlet	-90.67	-90.88
	(10.05)	(10.6)
Rural Area	-70.04	-69.33
	(9.96)	(9.87)
Type of Housing		
Rented Room	36.31	37.22
	(2.80)	(2.87)
Rented Suite	36.06	35.47
	(4.67)	(4.60)
Rented Single Dwelling	44.43	44.23
	(6.78)	(6.74)
Own-Hold Title	Omitted	Omitted
Own-Mortgage	45.57	45.69
	(5.30)	(5.31)
Squatter	-6.49	-6.51
	(.71)	(.71)
Room and Board	-28.85	-27.06
	(2.49)	(2.34)
Quality of Housing		
Above Standard	11.99	11.99
	(1.27)	(1.27)
Standard	Omitted	Omitted
Below Standard	-16.57	-16.68
	(3.20)	(3.22)
Number of Children		
Age 1-5	21.40	21.33
	(10.85)	(10.81)
Age 6-12	30.02	30.01
	(20.72)	(20.69)
Age 13 Plus	38.12	38.38
	(20.67)	(20.85)
MONTHDUM	Not Significant	Not Significant
R	.1425	-.0497
	(.59)	(.23)
Y_{TAX}	.2336	.32808
	(4.00)	(15.04)
Y_{TAX}^2	.000246	
	(1.74)	
R^2	.8005	.7998
Number of Observations	865	865

TABLE 2-4:

Spendable Income Equation for Unemployed Employable Welfare Recipients

	Dependent Variable =	Total Spendable Income Per Month
Independent Variables	*A*	*B*
Constant	99.16	99.11
	(16.26)	(16.20)
Two Adults	56.76	56.52
	(11.69)	(11.61)
Location		
City	Omitted	Omitted
Town	-35.43	-35.54
	(7.28)	(7.29)
Hamlet	-55.43	-55.40
	(7.70)	(7.67)
Rural Area	-34.25	-34.62
	(5.83)	(5.88)
Type of Housing		
Rented Room	Omitted	Omitted
Rented Suite	37.83	37.64
	(5.50)	(5.46)
Rented, Single Dwelling	49.57	49.61
	(6.74)	(6.73)

Own-Hold Title	-24.95	-23.77
	(2.70)	(2.57)
Own-Mortgage	31.12	30.34
	(3.04)	(2.96)
Squatter	-24.87	-24.82
	(3.05)	(3.04)
Room and Board	-6.96	-6.91
	(.98)	(.97)
Quality of Housing		
Above Standard	23.01	22.39
	(2.65)	(2.57)
Standard	Omitted	Omitted
Below Standard	-17.69	-17.27
	(4.04)	(4.15)
Number of Children		
Age 1-5	20.40	20.37
	(11.69)	(11.64)
Age 6-12	30.74	30.71
	(20.18)	(20.10)
Age 13 Plus	30.73	31.10
	(15.21)	(15.39)
MONTHDUM	5.32	5.57
	(1.68)	(1.76)
R	.95524	.36789
	(2.48)	(1.18)
Y_{TAX}	-.07942	.24198
	(.58)	(4.34)
Y_{TAX}^2	.000998	
	(2.58)	
R^2	.7856	.7843
Number of Observations	1,048	1,048

TABLE 2-5:

Spendable Income Equation for Mother with Dependent Child(ren) Welfare Recipients

	Dependent Variable =	Total Spendable Income Per Month
Independent Variables	*A*	*B*
Constant	106.55	106.75
	(17.88)	(17.89)
Two Adults	25.67	22.69
	(1.83)	(1.62)
Location		
City	Omitted	Omitted
Town	-30.82	-30.55
	(9.24)	(9.15)
Hamlet	-40.01	-39.77
	(5.54)	(5.50)
Rural Area	-52.69	-52.64
	(10.12)	(10.10)
Type of Housing		
Rented Room	4.52	5.28
	(.42)	(.50)
Rented Suite	47.44	47.27
	(8.30)	(8.26)
Rented, Single Dwelling	61.42	61.11
	(11.39)	(11.32)
Own-Hold Title	Omitted	Omitted
Own-Mortgage	39.13	38.33
	(6.30)	(6.18)
Squatter	-23.51	-23.98
	(2.92)	(2.98)
Room and Board	-5.11	-5.48
	(.63)	(.67)
Quality of Housing		
Above Standard	10.33	10.36
	(1.97)	(1.97)
Standard	Omitted	Omitted
Below Standard	-16.79	-17.06
	(4.31)	(4.37)
Number of Children		
Age 1-5	27.31	27.34
	(17.38)	(17.37)
Age 6-12	35.03	35.06
	(34.65)	(34.64)
Age 13 Plus	45.24	45.37
	(33.45)	(33.53)
MONTHDUM	3.74	3.59
	(1.56)	(1.50)
R	.82167	.61454
	(4.49)	(4.05)
Y_{TAX}	.06230	.24638
	(.64)	(7.22)
Y_{TAX}^2	.000727	
	(2.01)	
R^2	.7910	.7902
Number of Observations	1,075	1,075

FIGURE 2.1: Marginal Tax Rate Observed at Each Level of Y_{TAX}. (for Fully Employed Welfare Recipients).

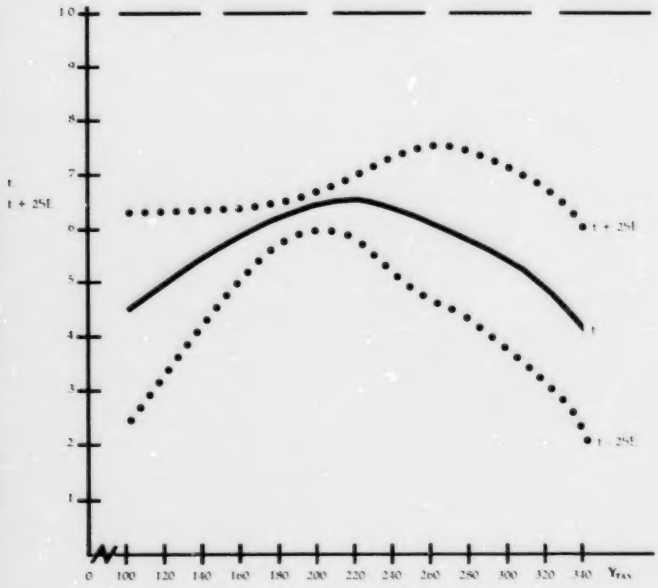


FIGURE 2.2: Marginal Tax Rate Observed at Each Level of Y_{TAX}. (for Partly Employed Welfare Recipients).

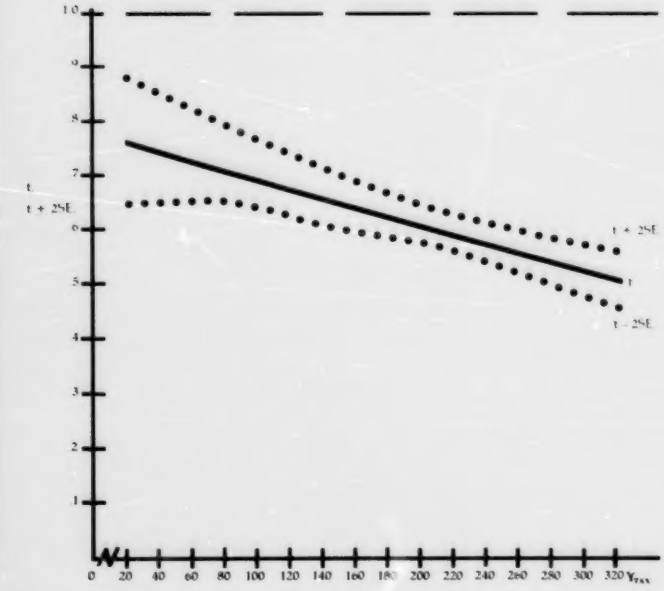


FIGURE 2.3: Marginal Tax Rate Observed at Each Level of Y_{TAX}. (for Unemployed Employable Welfare Recipients).

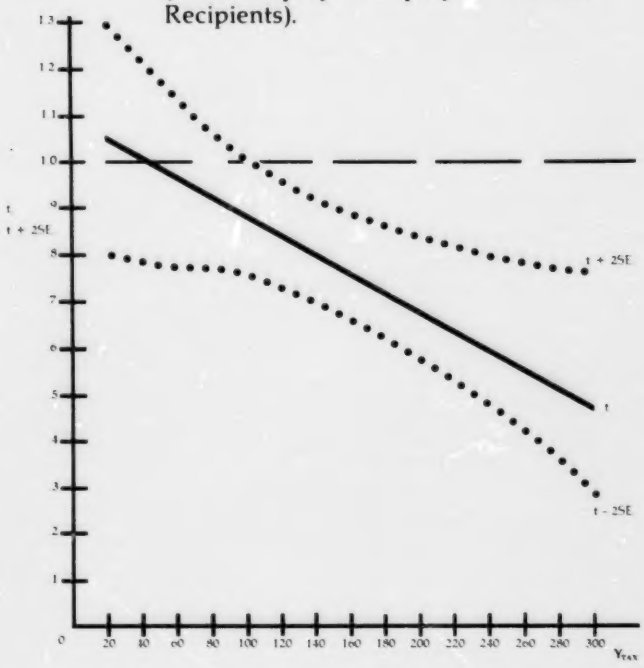
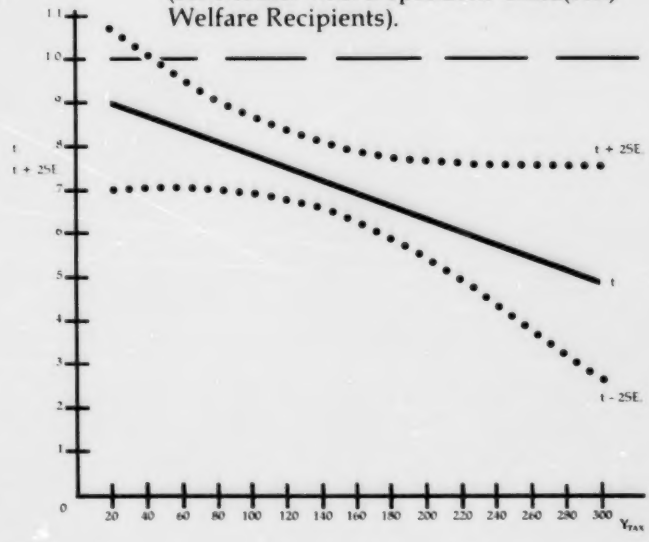


FIGURE 2.4: Marginal Tax Rate Observed at Each Level of Y_{TAX}. (for Mother with Dependent Child(ren) Welfare Recipients).



Potential Bias

The primary deficiency of the estimates of the marginal tax rates stems from the absence of actual housing expenses as an independent variable. Location, type of housing, and quality of housing have been used as proxies for this omitted variable. It is likely, however, that the amount of earned income will influence the recipient in his choice of housing. It can be shown that the tax rates previously estimated are biased if the actual housing expenses are positively correlated with earned income.[10] The error term and the earned income variable will be correlated if the influence of earned income on housing costs, and hence on the guarantee level, is omitted. The size of the bias generated by such a misspecification depends upon the extent of the correlation between the included and excluded variables. One can predict, however, that the estimated coefficient on the earned income variable will be greater than the actual coefficient. The estimates of the marginal tax rates derived from the coefficients would, therefore, be biased downwards.

Although the actual housing costs of the recipients in the two samples analyzed are not available and are very expensive to generate, there is a second source of data that can be used to determine whether the earlier estimates are biased. Actual housing costs are included in the data for a sample of 376 cases from the May, 1970 files. This sample contains both fully and partly employed recipients. The indicator separating fully from partly employed recipients was not recorded so it is impossible to dichotomize this sample. An estimate of the bias in the earlier samples may be made by running two regressions with this sample. Initially, the equation will be run with the same set of independent variables as were presented in Tables 2-2 and 2-3. The tax rate estimated from this regression is based on the assumption that actual housing costs must also be estimated. (The coefficient of Y_{TAX} is equivalent to $(1-t)^*$). Since this smaller sample contains both fully employed and partly employed recipients, the value of the marginal tax rate should be between 53 per cent and 67 per cent. The results are presented in Table 2-6. The coefficient on the Y_{TAX} variable indicates (i.e., $t = 1 - \beta$) that the marginal tax rate is 59 per cent.

Next, the variables used to estimate housing costs are replaced with the actual housing costs. This will provide an estimate free from bias due to the relationship between earned income and actual housing costs. The results of this regression are presented in Table 2-7. By comparing the coefficient on Y_{TAX} from this regression with the earlier coefficient, an estimate of the bias, ϕ, generated by using proxy variables for actual housing costs can be made.[11]

The use of actual housing costs significantly improves the results. Sex of the family head and location of residence are no longer of any importance in the explanation of total spendable income. In addition, the coefficients on the number of children variables clearly illustrate the premium paid to older children. Since the statutes specify that actual housing costs be provided, the coefficient on this variable should equal unity. The estimate of .9243 does not differ significantly from unity. The housing regulations are apparently enforced by the caseworker.

A comparison of the results in Table 2-6 and Table 2-7 indicate that the coefficient on Y_{TAX} is significantly reduced when actual housing costs are used in the regression. As suggested by the hypothesis that ε_i^* and Y_{TAX} are positively correlated, the specification using estimated housing costs underestimates the marginal tax rate, t. The uncorrected estimate of $\underline{t}$ is about .1 too low.[12] Using this estimate of the possible bias inherent in the earlier specifications, the welfare tax rates estimated for the four larger samples must be adjusted at most by .08 to .1 due to the relationship between Y_{TAX} and actual housing costs. Even after maximum adjustment, the welfare tax rates are significantly lower than the 100 per cent tax rate specified in the statutes of the welfare system. Table 2-8 describes the upper and lower estimates of the actual welfare tax rates. The adjusted figures assume the possible bias is the same in all categories.

A second downward bias in the estimate of the tax rate could be made in a cross-sectional analysis if t were to equal unity only after a time lag. If new earned income is not taxed for several months the tax rate measured from cross-section data would differ from 100 per cent even though the rate experienced by any individual eventually converges to 100 per cent. To test for this possibility, regressions have been run on the group of individuals appearing in both the September and January samples of fully employed and partly employed recipients. There were too few recipients in the other two categories sampled in both months to facilitate analysis. If the tax rate applied to earned income approaches one after a reasonable time lag, the tax rate experienced by this group of recipients should be higher in January, 1970 than in September, 1969.

There were 153 fully employed and 169 partly employed recipients in both samples. Table 2-9 presents the estimates of the marginal tax rates.

Although the tax rate measured does not increase significantly over the five-month period, there is an observable increase. This insignificant increase could be either a statistical artifact or an indication that the tax rate does converge to 100 per cent after a long adjustment process.[13]

TABLE 2-6:

Total Income Equation for a Combined Sample of Fully Employed and Partly Employed Recipients in May, 1970 (estimating housing costs).

	Dependent Variable =	Total Spendable Income Per Month
Independent Variable	*Coefficient*	*t-Statistic*
Constant	141.58	(10.35)
Sex-Adult		
Female, 1 Adult	Omitted	–
Male, 1 Adult	7.55	(.64)
Male, 2 Adults	23.08	(3.15)
Location		
City	Omitted	–
Town	-41.63	(4.38)
Hamlet	-56.08	(3.77)
Rural Area	-61.43	(5.21)
Quality of Housing		
Above Standard	26.08	(1.91)
Standard	Omitted	–
Below Standard	-14.91	(1.63)
Type of Housing		
Rented Room	55.71	(2.28)
Rented Suite	51.18	(4.23)
Rented, Single Dwelling	50.88	(4.55)
Own-Hold Title	Omitted	–
Own-Mortgage	41.10	(2.97)
Squatter	21.58	(1.34)
Room and Board	-17.81	(.98)
Number of Children		
Age 1-5	24.23	(7.08)
Age 6-12	30.06	(13.44)
Age 13 Plus	30.00	(10.94)
R	-.5519	(1.42)
Y_{TAX}	.4136	(12.62)

R^2 = .8144

Number of Observations = 376

TABLE 2-7:

Total Income Equation for a Combined Sample of Fully Employed and Partly Employed Recipients in May, 1970 (including actual housing costs).

	Dependent Variable =	Total Spendable Income Per Month
Independent Variable	*Coefficient*	*t-Statistic*
Constant	85.22	(8.40)
Sex-Adult		
Female, 1 Adult	Omitted	–
Male, 1 Adults	.006	(.00)
Male, 2 Adults	22.19	(3.58)
Location		
City	Omitted	–
Town	8.80	(1.06)
Hamlet	-3.66	(.28)
Rural Area	-7.72	(.73)
Actual Housing Costs	.9243	(13.40)
Number of Children		
Age 1-5	21.20	(7.33)
Age 6-12	27.15	(14.30)
Age 13 Plus	30.75	(13.72)
R	.14	(.42)
Y_{TAX}	.3186	(11.09)

R^2 = .8606

Number of Observations = 376

TABLE 2-8:

Upper and Lower Estimates of the Actual Welfare Tax Rate Paid by the Four Categories of Recipients.

	Upper Estimate	*Lower Estimate*
Fully Employed	63%	53%
Partly Employed	77	67
Unemployed	86	76
Mothers with Dependent Child(ren)	85	75

TABLE 2-9:
Estimates of Marginal Tax Rates Experienced by Identical Samples in September, 1969 and January, 1970

	Fully Employed		Partly Employed	
	Tax Rate	Standard Error	Tax Rate	Standard Error
September, 1969	.6528	.0722	.6369	.0392
January, 1970	.7035	.0545	.6526	.0375

Concluding Remarks

The empirical tests show that the welfare tax rate in effect in the Alberta welfare system is significantly less than the 100 per cent specified by the regulations. Recipients are able to increase their total income between 20 and 40 cents for each dollar earned.

From the data available, it is not possible to specify the mechanism that keeps the tax rate below 100 per cent on recorded non-welfare income. One likely explanation is that caseworkers include more work-related expenses than the basic exemption when they calculate each family's basic requirements, i.e., that there is a significant difference between gross earned income and earned income after the deduction of work-related expenses. The hypothesis that the measured difference between the statutory and effective tax rates is due to legitimate work-related expenses added by caseworkers to budgetary needs implies that between 20 and 40 per cent of earned income above the initial exemption is used up by expenses related to the job. The Alberta regulations do not suggest that many such legitimate expenses should be automatically included. The largest work-related expenses (child care and transportation costs) must be authorized through requisitions or through the regional office.

A second possibility is that caseworkers include either work-related or other expenses in the budget even though the expenses are not incurred. By this means, the effective tax rate on earned income can be kept below the statutory level. Such behavior is likely facilitated by the substantial discretionary power held by the caseworkers. Heffernan describes the attitude of pro-recipient caseworkers towards including exemptions as follows: "If you can't find another $50 worth of exemptions . . . turn in your pencils . . . you're through."[11] Any experienced caseworker knows whether and how such infringements of the regulations will be noticed.

Finally, informal liberalized regulations condoned at all levels of the welfare agency may be in effect. Although such an attitude might be commended if one is pro-recipient, it is not acceptable, since all potential and current recipients have the right to know exactly how the regulations are going to be applied. Whatever the mechanism, the actual tax rate on earned income is significantly less than 100 per cent.

The above result does not imply that recipients are aware that the tax rate is less than specified. The decision of an unemployed recipient to seek or avoid work may be based more on the specified regulations than on the effective tax rates. It is hard to believe, however, that recipients earning income are unaware that the earnings increase their total income.

The difference between the actual and the statutory rate as observed by analyzing the entire sample of recipients does not necessarily imply that every recipient faces a tax rate of 60 to 80 per cent. The tax rate experienced by any given recipient may depend upon such factors as his or her dealings with the caseworker or the point of time at which the earnings began. If the tax rate is influenced by the discretionary power of the caseworker, it is conceivable that a respected recipient will experience a lower tax rate than a recipient who is disliked or considered lazy by the caseworker. The time pattern of earnings may lead to dissimilar tax rates if, for example, a recipient with some earned income at the time he first applies for welfare faces a higher rate than a recipient who begins to earn income after receiving welfare for some time.

Given that the 100 per cent tax regulation is not enforced, the results of implementing new welfare regulations with lower tax rates are not clear. Suppose a tax rate of 80 per cent is regulated and actually enforced. The results of such an improvement in the regulations depend on whether recipients respond to the rules or to the tax rates actually effective both before and after the change. Including work incentives in the regulations may have little impact on the behavior of recipients if the "new" incentives simply describe the present operation of the welfare system.

Chapter III

Labor Supply and Welfare: The Theoretical Framework

The willingness of current and potential welfare recipients to work under various income maintenance schemes is a crucial factor in establishing how much any plan would cost if implemented. If the present welfare system is altered, either as suggested in the Department of National Health and Welfare proposals, or towards a more generalized guaranteed income plan, both the newly eligible and the previously eligible recipients will encounter higher support payments and altered incentive plans. Since the eventual cost of any new plan depends on the work-leisure choice of the individuals in these two groups, we must estimate the influence on their work behavior of wage and income changes.

The impact on work behavior can be measured only by implementing a new set of welfare regulations. This alternative is not comforting, however, since there are a number of plans from which to choose. An intelligent choice depends upon prior knowledge about the consequent change in work effort under each plan. Such information can be developed either through pilot projects or by the analysis of existing cross-sectional data to observe how low-income people and welfare recipients respond to wage and income changes.

This study uses disaggregated cross-sectional data to estimate the impact of wage and income changes on the work effort of those currently receiving welfare. The sample does not include observations of low-income people not presently eligible for welfare or of those eligible but not receiving welfare. Static labor supply theory predicts that a welfare system expanded to include currently ineligible low-income people will induce a reduction in their work effort. Theory cannot predict the extent of the work reductions, hence, the effect on the overall cost of any program.

Static theory cannot even predict the sign of the change in work effort of the current welfare recipients due to an alteration of the welfare legislation that both increases benefits and reduces the disincentives to work. This study will provide empirical evidence for determining whether an increase in welfare payments accompanied by the provision of work incentives will increase or decrease the work effort of the present welfare population.

Each recipient faces a different set of wage and income alternatives in choosing to work or to be on welfare. If a recipient can earn a high wage, the price of his leisure, and hence the price of being on welfare, is very high. Individuals with a high earning potential are expected to select more work and less leisure than individuals with a very low wage potential, *ceteris paribus*. In addition, an individual's wealth, no matter how many hours he works, is increased by the availability of non-labor income. Such non-labor income is available to welfare recipients, since the welfare system guarantees a steady flow of income if the recipient's alternative sources of income are inadequate to meet his needs. If leisure is not an inferior good, an increase in wealth should encourage the selection of leisure instead of work. Those recipients qualifying for high welfare payments should choose to work less than those receiving only small welfare payments. Since the wage alternatives and welfare payments vary among welfare recipients, their labor supply responses should vary according to the predictions of the model.

By changing the welfare regulations, the after-tax wage rate and non-labor income level available to each recipient can be altered. We will estimate the total effect of such changes on work effort by using the differences in work effort at various wage and income levels that are observed in the cross-section of current recipients. In using disaggregated cross-sectional data, we depend on the crucial assumption that the differences in behavior among individuals at different wage and nonemployment income levels indicate changes in the behavior of individuals if their wages or incomes were altered.

The general type of labor supply model being estimated is described in Part I. The results of similar studies carried out in the United States are discussed in Part II. Part III presents a discussion of the variables used to estimate the amount of labor supplied, the wage rates, and the guarantee level. Finally, Part IV specifies the model to be estimated.

Labor Supply Theory

The amount of labor supplied by any individual is a function of how he chooses to allocate his time. People work for a wage either in the market place or in the household. Instead of working, at home or at a job, an individual could be receiving education, looking for a job, or consuming leisure. In this study, few of the recipients are involved in any type of educational program, so this is not a relevant alternative to work or leisure. Some of the time spent at activities other than working could be time spent searching for a job. The choice available to each recipient, then, is among working for a wage, working

at home, searching for a job, or consuming leisure. With the data available, we cannot distinguish among leisure, search time, and home work. These other uses of time together represent the complement of market work.

Although an unemployed individual actively searching for a job is considered to be in the labor supply, the welfare system must still provide enough income to cover his needs. For this reason, the distinction between market work and its complement is important for estimating the results of applying any set of welfare regulations. Since the total time available is allocated on the basis of the price of each alternative, the decision depends upon the wage rate available, the market and home work productivities of the other family members, the value of the person's productivity in the household, and the amount of non-labor income available to the family. The value of search time is assumed to be a function of, and represented by, the wage rate available. To the extent that any person can choose between working and not working, these factors will be considered, and the optimal amount of work effort can be selected. Unfortunately, the choice between work and leisure is often not continuous, since a person must either work the required number of hours for a job or not work at all. By moonlighting, working overtime, or combining several part-time jobs, an individual can adjust towards the optimal amount of work. The amount of labor supplied by any individual who has completed his schooling can be considered a function of the above factors as follows:

$$L = L(r, r_i, r_{II}, r_{III}, Y) \qquad (3.1)$$

where

- L is the amount of labor supplied by the individual during some time period.
- r is the wage rate available to the individual.
- r_i are the wage rates available to other members of the individual's family.
- r_{II} is the individual's home wage rate or the value of his productivity in the household.
- r_{III} is the home wage rate of other members of the individual's family.
- Y is the non-labor income available to the family.

The estimation of such a relationship is complicated by both conceptual and empirical problems. The major problem is to locate a variable that represents the amount of labor supplied by each individual. In this study, since there is no specific information describing the amount of work done by each recipient over any time period, it is necessary to use a proxy variable—length of time on welfare—that has the same relationship to the wage and income variables.

In dealing with the labor supply or potential labor supply of welfare recipients, wage rates are usually not directly available since few recipients are employed. An estimate of the potential wage rate available to each recipient is generated from the earnings of the fully employed welfare recipients with similar characteristics. The potential wage rate of other family members will not enter into the relationship for two reasons. First, no wage rates and virtually no socio-economic characteristics are available for the other family members. Second, aggregate data show that an extremely small percentage of the other family members have any earned income.[1] The data do not establish whether this lack of employment is voluntary or involuntary. They do, however, indicate that other family members rarely work.

A third problem is that the value of home productivity is almost immeasurable as it is rarely expressed in financial terms. For male recipients, the value of home productivity is not likely to be a significant element in the decision to work. For female recipients, however, the amount of welfare received is a proxy for the value of home productivity. Both the value of home productivity and the amount of welfare income guaranteed increase as the number of children supported increases. Consequently, the home productivity effect and the pure income effect cannot be estimated separately. An increase in home productivity or an increase in the welfare guarantee both operate to reduce the amount of labor supplied. In this same sense, the home productivity of the wife of any male recipient is represented by the level of the welfare payment. However, no direct measure of home productivity is available for the other family members.

The empirical estimates of equation (3-1) will use only two main independent variables: the potential wage rate available to each recipient in the market place and the amount of non-labor income available to the family from the welfare system. For female recipients, the influence of the latter variable on labor supply is a combined wealth and home productivity effect.

Review of Related Research

At this time, no research results using Canadian data have been presented on the impact on work effort

of various income and wage changes. The complete absence of adequate data on the behavior of any group, let alone of the poor, is the cause of the lack of research in this area. Hopefully, the recent access to some income tax data and the expanded version of the 1971 Census of Canada will facilitate some broad studies of the work behavior of all economic groups.

A number of research studies using United States data have discussed the work response to changes in wage and income levels of low income people.[2] Most of these studies are less concerned with the work effort of current recipients than with the work effort of the broad group of individuals who would become eligible under expanded welfare legislation. Of particular interest to this study is the research by Leonard J. Hausman on the work effort of females supported under the AFDC program.[3] Hausman's sample includes only people receiving assistance. The labor force status of AFDC recipients in three states was related to a number of fixed income variables, a variable describing the welfare tax rate paid, variables used as proxies for the potential wage rate, and a number of control variables. Just as labor supply theory predicts, the probability of being in the labor force was directly related to the potential wage rate and inversely related to fixed income and the welfare tax rate. Hausman concludes that the group of AFDC mothers are more sensitive to income changes than to tax rate changes.

Hausman's results must be interpreted cautiously, however, since the welfare tax rate is not correctly entered into the model. Hausman introduces the welfare tax rate as an independent variable in the labor supply regressions. This specification implies that the tax rate directly determines the amount of labor supplied instead of acting as a factor establishing the after-tax wage rate. In a simplified form, Hausman is attempting to estimate the following relationship:

$$L = \alpha(1-t)w + \beta Y^F \qquad (3.2)$$

where

L = some measure of labor supply or work effort of AFDC mothers.

w = the potential wage rate.

Y^F = a measure of fixed income.

t = the welfare tax rate.

The variation in the implicit welfare tax rate, t, facilitates developing several estimates of the parameter α. Instead of estimating some form of the relationship as:

$$L = \alpha w - \alpha t w + \beta Y^F \qquad (3.3)$$

which would provide proper estimates of α, Hausman enters t as an independent variable as follows:

$$L = \alpha_1 w - \gamma t + \beta_1 Y^F \qquad (3.4)$$

It is difficult to attribute any meaning to the coefficient γ. In my study, since the data are derived from only one welfare system, the welfare tax rate is not a variable so only one estimate of the coefficient can be made. The multiple estimates of α possible with Hausman's data would be a substantial advantage.

The data available to Hausman were, however, inferior to the data on the Alberta welfare system in several ways. Hausman used the number of years of schooling completed as a proxy for potential wage rate. In this study, a potential wage rate available to each recipient has been generated on the basis of his occupation, skill, education, sex, location of residence, and race. Perhaps the greatest advantage of the Alberta data is that they include observations from three categories of recipients in addition to the Mothers with dependent child(ren) category. The response of the employed and employable welfare recipients to wage and income changes are crucial in the determination of the cost of a welfare program for the working poor.

Description of Variables

1. DURATION OF ASSISTANCE

The length of time each recipient has been on assistance is used to approximate the amount of labor supplied. The welfare duration variable describes the number of continuous months each recipient has chosen to allocate at least part of his total time to activities other than a job.[4] Since we are analyzing the type of attrition that takes place from welfare, normal labor supply response by the recipients will be picked up by the duration variable. Labor supply theory suggests that welfare recipients with high-wage possibilities will be more likely to choose work than recipients with low-wage alternatives. Over a number of months, more high-wage than low-wage recipients will drop off welfare. This attrition is observed when the long-term recipients are compared with the short-term recipients, as when duration of assistance is used as the dependent variable. Attrition will not only occur between a category of welfare and self-sufficiency. Since two of the samples being analyzed include recipients who are working (fully employed and partly employed), attrition can

occur from one category to another as well as from any category of welfare to self-sufficiency. The hypothesis is that the potential wage level and the non-labor income level determine the probability of moving among categories or to self-sufficiency. For example, a recipient with high wage potential is more likely, *ceteris paribus,* to move from the unemployed employable category either to self-sufficiency or into one of the employed but insufficient income categories than is an individual with a low wage alternative. Similarly, a fully employed recipient with a high wage rate is more likely to become self-sufficient and drop out of the welfare system than is a fully employed recipient with a very low wage rate. An analogous argument holds for the level of non-labor income available to each recipient.

The nature of the dependent variable ensures that only a small percentage of its variation will be explained by the wage and income variables. The strength of our hypothesis is reduced since many recipients with characteristics suggesting they will become long term recipients have, at the time of measurement, been on welfare for only a short time. The independent variables would be more powerful if we could use completed length of time on welfare as the dependent variable. One assumption is required in the contention that the structure of current durations are indicative of completed durations. We must assume that the functional relationship between labor supply and the wage and income variables was the same for each group of new recipients over the months. This assumption implies that the static labor theory is as applicable now as it was five years ago.

A further complication is introduced by the incomplete nature of the duration variable: the absolute magnitudes of the coefficients on the independent variables in the regressions will be of questionable value. The sign and significance of the variables are important. The relative size of the income and substitution elasticities must be considered when we predict the probable impact of any statute change on work effort.

2. POTENTIAL WAGE RATES

The wage rate for fully employed recipients can be derived directly from their monthly earned income. On the assumption that the term "fully employed" refers to the same number of work hours for each recipient, the monthly earned income variable becomes a measure of the wage rate. Wage rates for recipients who are not fully employed must be estimated.

A model for predicting a potential wage for all recipients has been developed from the wage rates and socio-economic characteristics of the fully employed welfare recipients. I consider this estimate better than any estimate possible using wage data on similar individuals who are employed and self-sufficient. The only broad wage and characteristic data on self-sufficient individuals come from the 1961 Census of Canada. These data are not only very old but are also less detailed than the data available on the welfare recipients.

The income earned per month (r) by the fully employed welfare recipients was regressed against a number of socio-economic variables. The specification generating the highest explanation is used to estimate a potential monthly income, $\hat{r}$, for each of the recipients. Both r and $\hat{r}$ will be tried in the labor supply model for the fully employed sample. The general form of the potential wage equation is:

$$r = r(L_c, A, S, E_d, R, S_k, O_c) \qquad (3.5)$$

where

L_c is the location of residence: city, town, hamlet, or rural area.

A is the age of the recipient.

S is the sex of the recipient.

E_d is the number of years of schooling completed by the recipient.

R is a variable indicating whether or not the recipient is Caucasian. Most of the non-Caucasian recipients are of Indian or Metis background.

S_k is a dummy variable with the value one if the recipient has "some trade skill" and zero if he has "no trade skill."

O_c enters in which, if any, occupation the recipient is now or has been working.

3. THE INCOME GUARANTEE

The amount of income guaranteed to each family on welfare in the event they have no earned income must be estimated, since we have shown in Chapter II that the welfare tax rate is not applied according to the statutes. Because the tax rate is significantly less than 100 per cent, the total income available to the recipients is not equal to the income guaranteed if there are no earnings. The following relationship:

$$Y = G + (1-t)Y_{TAX} + R \qquad (3.6)$$

was estimated in the form shown below:

$$Y = C + \alpha_i X_i + \beta Y_{TAX} + \gamma R + \varepsilon \qquad (3.7)$$

The amount of income guaranteed to each recipient can be directly estimated from equation (3.7) and is described by:

$$G = Y - \beta Y_{TAX} - \gamma R \qquad (3.8)$$

Formal Model

The length of time any recipient has been on welfare is hypothesized to be a function of the recipient's potential wage rate and the amount of non-labor income guaranteed by the welfare system. In Chapter II, the welfare tax rate paid by fully employed welfare recipients was estimated. This rate will be used to adjust the potential wage rates to an after-tax basis. Welfare legislation can alter the after-tax wage rate by changing the welfare tax rate.

The following relationship is to be estimated:

$$D = D(\hat{r}^*, G) \qquad (3.9)$$

where

- D = duration of recent assistance for each recipient (number of months).
- $\hat{r}$ = an estimate of the potential wage rate available to each recipient (expected earned income per month if fully employed).
- $\hat{r}^*$ = $(1-t)\hat{r}$; the after-tax potential wage rate.
- t = the rate at which income earned by the fully employed welfare recipients is taxed by the welfare system.
- G = the amount of income guaranteed to each recipient even if their earned income is zero.

Wage and income changes have three types of impact on the duration of assistance. Since a rise in the wage rate increases the price of leisure, we would expect welfare recipients experiencing such a rise to remain on welfare for a shorter period of time due to a substitution towards more work. In addition to increasing the price of leisure, a higher wage increases the individual's wealth and, if leisure is not an inferior good, induces him to purchase more leisure. The income and substitution effects of a wage change operate in opposite directions.

The wealth of any recipient, at any amount of work effort, increases with the amount of income guaranteed to him by the welfare system. The income effect produced by an increase in wealth leads to the consumption of more leisure. For any recipient, the likelihood of a long stay on welfare increases with the level of the income guarantee.

To predict the impact of new welfare regulations on the labor supplied by the current welfare recipients, the relative magnitude of the income and substitution elasticities must be estimated. Two specifications of the model will be used to develop these estimates.

1. LINEAR APPROXIMATION

The duration of assistance is assumed to be a linear function of the potential after-tax wage rate, $\hat{r}^*$, and the guarantee level, G.

$$D = C + \beta_1 \hat{r}^* + \beta_2 G + \varepsilon \qquad (3.10)$$

The coefficient on the guarantee variable is the income parameter since it describes the change in duration due to an increase in the income guarantee. A positive sign is expected on this coefficient.

$$\frac{\partial D}{\partial G} = \beta_2 = \text{Income Parameter}$$

The substitution effect must be derived from the coefficient on the after-tax wage variable. The change in duration due to a wage increase, β_1, includes both an income and a substitution effect and is referred to as the uncompensated wage effect. Since the uncompensated wage effect is composed of an income and substitution effect, whose signs are opposite, the net sign of the coefficient is ambiguous.

$$\frac{\partial D}{\partial \hat{r}^*} = \beta_1 = \text{Uncompensated Wage Effect}$$

The uncompensated wage effect consists of a substitution effect, S, plus an effect due to the change in income resulting from a wage change. By theorem:

$$\frac{\partial D}{\partial \hat{r}^*} = S + \frac{\partial D}{\partial Y}\frac{\partial Y}{\partial \hat{r}^*} \qquad (3.11)$$

Let

- H = percentage of the month worked.
- $\hat{r}^*$ = potential after-tax wage rate in dollars per month.
- Y = total earned income per month.

Then,

$$Y = H \times \hat{r}^*$$

and

$$\frac{\partial Y}{\partial \hat{r}^*} = H \qquad (3.12)$$

Replacing $\partial Y/\partial \hat{r}^*$ in (3.11) with H, we get:

$$\frac{\partial D}{\partial \hat{r}^*} = S + H\frac{\partial D}{\partial Y} \qquad (3.13)$$

and hence,

$$S = \frac{\partial D}{\partial \hat{r}^*} - H\frac{\partial D}{\partial Y} \qquad (3.14)$$

where

$\frac{\partial D}{\partial \hat{r}^*}$ = Uncompensated Wage Effect = β_1

$\frac{\partial D}{\partial Y}$ = Income Parameter = β_2

The substitution effect can be derived directly from the regression results as follows:

$$S = \beta_1 - \bar{H}\beta_2 \qquad (3.15)$$

where

$\bar{H}$ = the mean value of the percentage of the month worked by the recipients.

The substitution effect must be negative. If the uncompensated wage effect is positive, the compensating term ($\bar{H}\beta_2$) must be large enough to generate a negative value for the substitution effect.

2. TOTAL DIFFERENTIAL APPROACH

By estimating the total differential of the duration equation, both the substitution effect and the income parameter are directly produced by the regressions. We want to estimate the total differential of $D = D(\hat{r}^*, G)$.

$$dD = \frac{\partial D}{\partial \hat{r}^*} d\hat{r}^* + \frac{\partial D}{\partial G} dG \qquad (3.16)$$

By theorem,

$$\frac{\partial D}{\partial \hat{r}^*} = S + \frac{\partial D}{\partial G} H$$

If we let $\partial D/\partial G$, the income parameter, equal I, $\partial D/\partial \hat{r}^*$ in (3.16) can be replaced with $S + I\bar{H}$. And, since,

$\hat{r}$ = potential wage rate

$\hat{r}^* = (1-t)\hat{r}$ = potential after-tax wage rate,

we can replace $d\hat{r}^*$ in (3.16) with $(1-t)d\hat{r}$. Equation (3.16) can be rewritten as:

$$dD = [S + I\bar{H}](1-t)d\hat{r} + IdG \qquad (3.17)$$

Assuming the changes are the differences about the means, equation (3.17) can be estimated in the following form:

$$D = C + \beta_3[(1-t)\hat{r}] + \beta_2[G + (1-t)\hat{r}\bar{H}] + \varepsilon \qquad (3.18)$$

In this case, the coefficients β_3 and β_2 are exactly equal to the substitution effect and the income parameter respectively.

The elasticities at the mean values of the variables can be derived from the substitution effect and the income parameter estimated from equations (3.10) and (3.18) by multiplying by $\hat{\bar{r}}^*/\bar{D}$ and $\bar{Y}/\bar{D}$ respectively.

where

$\hat{\bar{r}}^*$ is the mean potential after-tax wage in dollars per month.

$\bar{D}$ is the mean duration of assistance in months.

$\bar{Y}$ is the mean total spendable income in dollars per month.

The relative size of these elasticities can be used to estimate whether a change in the welfare regulations would increase or decrease the work effort of the individuals already on welfare.

In Chapter IV, the specific problems involved in estimating equations (3.10) and (3.18) are discussed and the precise variables used are described. Finally, the regression results are presented and analyzed to establish whether or not they are consistent with the predictions of a static labor supply model.

Chapter IV

The Empirical Results

The consistency of the duration pattern of current Alberta welfare recipients to static labor supply theory is determined by estimating the relationship between duration of assistance and the variables describing the potential wage rate and the amount of income guaranteed by the welfare system. If the duration pattern is consistent with the predictions of labor supply theory, i.e., if the wage and income coefficients have the expected signs, the income and substitution elasticities will be compared so that the net effect of a change in the welfare statutes on the work effort of the current welfare recipients can be predicted. Estimates of the income and substitution effects are made from the following two specifications of the model:

$$D = C + \beta_1 \hat{r}^* + \beta_2 G + \varepsilon_i \qquad (4.1)$$

$$D = C + \beta_1 (1-t)\hat{r} + \beta_2 [G + (1-t)\hat{r}\bar{H}] + \varepsilon_i \qquad (4.2)$$

where

β_1 = Uncompensated Wage Effect

β_2 = Income Parameter

β_3 = Substitution Effect

The variables $\hat{r}^*$, G, and $\hat{r}$ are readily available in the form described in Chapter III. One variable, $[G + (1-t)\hat{r}\bar{H}]$, is not directly available and will be replaced by a proxy variable as described in Part I. A simultaneity problem exists in the estimation of the total differential specification, equation (4.2). Part II discusses the problem, the samples in which it may occur, and the instrumental variable approach used to avoid the resulting error in the estimates of the coefficients. Part III describes both the control variables included in the regressions and the interaction variables entered to facilitate the estimation of different income and substitution effects for male and female recipients. The specification applied to estimate a potential wage rate for each recipient is presented in Part IV. In Part V, both the results of estimating equations (4.1) and (4.2) and the resulting income and substitution elasticities are described. In Part VI, the sign and magnitude of the elasticities are interpreted in the framework of static labor supply theory. Part VII is a summary and conclusion.

Specific Form of the Variable, $G + (1-t)\hat{r}\bar{H}$

A proxy variable has been used to replace $[G + (1-t)\hat{r}\bar{H}]$ in equation (4.2). The new variable differs in three ways from the variable it represents. First, the term, $\hat{r}\bar{H}$, is estimated by using the actual earnings per month of each recipient. The variable used is actually more accurate than $\hat{r}\bar{H}$ since it includes both the actual wage rate and the actual time worked. Unfortunately, the actual wage rate cannot be separated from the influence of amount of time worked, so the other economic variable, $(1-t)\hat{r}$, must use an estimate of the wage rate. As a result, two different forms of the wage rate are introduced in equation (4.2). Second, the welfare tax rate actually paid by each recipient, t_i, rather than the tax rate he would pay if fully employed, is used to adjust the earned income. As a result, two estimates of the tax rate are used in the same equation. In fact, for marginal changes the recipient presumably responds to a tax rate somewhere between his current tax rate and the rate effective for fully employed recipients. Finally, an adjustment is made because a small amount of earned income, the amount R, is not taxed. Equation (4.2) is estimated in the following form:

$$D = C + \beta_1 (1-t)\hat{r} + \beta_2 [G + (1-t_i)Y_{TAX} + R] + \varepsilon_i \qquad (4.3)$$

where

t_i = the welfare tax rate paid by each recipient.

$Y_{TAX} = [Y_e - 25.00]$

if $Y_e > 25.00$

$= [0]$

if $Y_e < 25.00$

$R = [25.00]$

if $Y_e > 25.00$

$= [Y_e]$

if $Y_e < 25.00$

Y_e = earned income per month

This form of the variable, $G + (1-t_i)Y_{TAX} + R$, is readily available since it has been shown, in Chapter II, to be exactly equal to the total spendable income available to each recipient, Y. So:

$$Y = G + (1-t_i)Y_{TAX} + R$$

Problem of Simultaneity

If the length of time a recipient has been on welfare influences his willingness to work, the amount of income earned by each recipient will be determined

jointly with the duration of assistance. If such simultaneity occurs, the least squares estimator of the total differential specification of the model, equation (4.3), will be biased and inconsistent. This happens because the dependent variable, duration of assistance, and the independent variable, $[G + (1-t_i)Y_{TAX} + R]$, are jointly determined, and the so-called independent variable and the error term will be correlated. A consistent estimator is provided by two stage least squares. In the first stage, the exogenous variables in the model, such as type and quality of housing, number and age of the dependent, and location of residence, are used to predict a value for $[G + (1-t_i)Y_{TAX} + R]$. Since the predicted value of the variable is independent of the disturbance term, it can be used in ordinary least squares estimation of (4.3).

Simultaneity is not a problem in all of the samples being analyzed. Since there is no variation in the amount of labor supplied by the fully employed recipients, the disturbance term and $[G + (1-t_i)Y_{TAX} + R]$ are not correlated and ordinary least squares is unbiased. For the Unemployed employable and Mother with dependent child(ren) samples, most of the small amount of "earned income" is not labor income but is from fixed sources other than the welfare agency. Although it is unlikely that the length of time a recipient has been on welfare will influence these payments, the estimation will be done by two stages as well as by ordinary least squares. There is substantial variability in the amount of income earned by recipients in the partly employed sample. Since the duration of assistance may partially determine how much these recipients are willing to work, two stage least squares will be used to estimate the total differential specification for this sample.

Control and Sex-Interaction Variables

1. CONTROL VARIABLES

The regressions will include, in addition to potential wage and guaranteed income variables, the age of the recipient in the form of a set of six dummy variables. Since young recipients could not have long durations of assistance, it is essential to control for age while measuring the impact of the economic variables on duration of assistance. The duration of assistance is expected to be higher for the older recipients.

The impact on the duration of assistance of such personal characteristics as race, education, and location of residence should be exerted through the potential wage rate. Part IV of this chapter describes how these variables are used in estimating the potential wage and thus are indirectly entered into the duration equation. In addition, these characteristics were entered directly into the regressions in an attempt to control for different demand conditions for individuals with different personal characteristics. Race and education were not significant explanatory variables in the potential wage rate estimator, and they were only entered directly in the duration equation. Location of residence was entered directly and also indirectly through the estimator of the potential wage rate.

2. SEX-INTERACTION VARIABLES

Income and uncompensated wage effects could be estimated both for males and females by estimating the parameters of the following two equations:

$$D = C^m + \beta_1^m \hat{r}^* + \beta_2^m G + u^m \qquad (4.4)$$

$$D = C^F + \beta_1^F \hat{r}^* + \beta_2^F G + u^F \qquad (4.5)$$

The parameters of equation (4.4) refer to males and those of equation (4.5) refer to female recipients. The two equations can be combined using interaction terms if we assume that the disturbance terms for males and females, u^m and u^F, have similar variances. A dummy variable, F, is used to permit a distinction between the coefficients for males and females when the relationship is estimated as a single equation.

Let

F = 1 if female

= 0 if male

Combining (4.4) and (4.5) gives the following equation for estimation:

$$D = C + F + \beta_1 \hat{r}^* + \beta_1'(F \times \hat{r}^*) + \beta_2 G + \beta_2'(F \times G) + u \qquad (4.6)$$

where

β_1 = Male uncompensated wage effect

$\beta_1 + \beta_1'$ = Female uncompensated wage effect

β_2 = Male income parameter

$\beta_2 + \beta_2'$ = Female income parameter

Similarly, the total differential specification, equation (4.3), is specified as follows:

$$D = C + F + \beta_3(1-t)\hat{r} + \beta_3'(F \times (1-t)\hat{r}) + \beta_2[G + (1-t_i)Y_{TAX} + R] + \beta_2'(F \times [G + (1-t_i)Y_{TAX} + R]) + u \qquad (4.7)$$

where

β_3 = Male substitution effect

$\beta_3 + \beta'_3$ = Female substitution effect

β_2 = Male income parameter

$\beta_2 + \beta'_2$ = Female income parameter

The results of estimating equations (4.6) and (4.7), with various sets of control variables, are presented in Part V.

The Potential Wage Rate Equation

The income earned per month (r) by the fully employed welfare recipients was regressed on a number of their socio-economic characteristics. We assume there is no variation in the number of hours worked by the fully employed recipients. Sex, age, location of residence, skill, education, race, and occupation were tried in a number of combinations. Table 4-1 presents the distribution of each of the independent variables used. The equation selected for use as a wage predictor is presented in Table 4-2. The coefficients from this regression are used to generate a potential wage rate, $\hat{r}$, for each of the recipients, including the fully employed recipients.

All but two of the personal characteristic regressors contribute significantly to the explanation of the income earned per month, and the coefficients on the variables are generally of the expected relative magnitude. Racial origin and number of years of education do not add significantly to the explanation regardless of the other variables used in the regression. The results for the other regressors follow:

SEX

Male recipients earn substantially more than female recipients. The coefficient on the male variable was $83.74 per month.

AGE

Recipients in the middle age categories earn more than either the young or old. The highest average income is observed for those recipients between 35 and 44 years old.

LOCATION

Recipients living in the cities generally earn higher incomes than those in less populated areas. The coefficient on the hamlet variable is not significantly different from the one on the city variable. This result could easily be due to a peculiar observation among the small number of hamlet residents in the sample.

SKILL

A small but significant premium is recorded for recipients with some type of trade skill. Some of the skill differential may be absorbed by the occupation variables, since a number of them refer directly to skilled categories.

OCCUPATION

The smallest coefficients were observed in the farm worker, hunter, farm operator, service, and unskilled categories. Skilled and semi-skilled, production, sales and clerical workers are estimated to be high wage categories among the fully employed recipients.

TABLE 4-1:
Number of Observations in Each Dummy Variable Used for Estimating the Wage Equation from the Fully Employed Sample.
(750 observations)

Variable	*Number of Observations*
Sex	
Male	306
Female	444
Age	
Under 20	2
20 to 24	61
25 to 34	251
35 to 44	274
45 to 59	155
60 and older	7
Location	
City	576
Town	105
Hamlet	22
Rural area	47
Skill	
Some skill	319
No skill	431
Education	
Illiterate	13
Grade 1 to 8	261
Grade 9, 10, 11	363
Grade 12	107
Some university	6

Variable	*Number of Observations*
Race	
Caucasian	660
Non-Caucasian	90
Occupation	
Manager, proprietor or technical worker	28
Clerical worker	168
Sales worker	37
Protective service worker	11
Food, household, and other service worker	198
Truck driver, equipment operator, miner, or oil worker	44
Farm worker or fisherman, trapper or hunting guide	25
Farm operator	5
Skilled tradesman	33
Trade apprentice and tradesman's helper	19
Skilled and semi-skilled service and production worker	34
Logger, warehouseman, and unskilled production process worker	20
Unskilled laborer	84
Other	32
Not stated	12

TABLE 4-2:

Potential Monthly Wage Equation Generated from the Sample of Fully Employed Recipients

Dependent Variable = Total Income Earned Per Month

Independent Variables	*Coefficient*	*t-Statistic*	*F-Statistic*
Constant	130.83	7.12	
Male	83.74	9.65	
Age			
Under 20	2.77	.53	
20 to 24	-14.15	1.35	
25 to 34	Omitted	–	
35 to 44	38.19	5.88	9.60*
45 to 59	22.22	2.85	
60 and older	-19.61	.70	
Location			
City	Omitted	–	
Town	-18.94	2.41	
Hamlet	3.39	.21	4.15*
Rural area	-33.26	2.75	
Skill	12.66	1.96	
Occupation			
Manager, proprietor or technical worker	69.91	3.19	
Clerical worker	110.10	5.75	
Sales worker	87.81	4.26	
Protective service worker	25.16	.93	
Food, household and other service worker	76.49	4.32	
Truck driver, equipment operator, miner, or oil worker	79.16	4.15	4.41*
Farm worker or fisherman, trapper or hunting guide	Omitted	–	
Farm operator	58.26	1.63	
Skilled tradesman	96.02	4.61	
Trade apprentice and tradesman's helper	105.00	4.60	
Skilled and semi-skilled service and production worker	106.24	4.93	
Logger, warehouseman, and unskilled production process worker	99.35	4.25	
Unskilled laborer	60.50	3.54	
Other	81.39	3.70	
Not stated	22.32	.83	

$R^2 = .3009$ *Significant at 1% level

Number of Observations = 750

Duration Regression Results and the Elasticities

1. FULLY EMPLOYED RECIPIENTS

The regressions for the sample of fully employed

recipients were run with both an estimate of the potential wage rate, $\hat{r}$, and the actual wage rate, r. The set of age variables substantially improves the explanatory power of the model. Neither the age-sex interaction variables nor the race, education, or location of residence control variables add significantly to the explanation.

The means of the principal variables employed in the regressions and in the elasticity calculations are presented in Table 4-3.

(a) ESTIMATES USING THE POTENTIAL WAGE RATE, $\hat{r}$

The coefficients from the linear approximation regressions are presented in columns A and B of Table 4-4. Columns C and D in Table 4-5 show the coefficients from the total differential regressions. The t-statistics are shown in parentheses.

Both specifications give estimates of the income effect for male recipients that are significantly greater than zero at the 5 per cent level. For female recipients, the income effect is not significantly different from zero for either specification.

For male recipients, neither the uncompensated wage effect shown in Table 4-4 nor the substitution effect described in Table 4-5 are significantly different from zero at the 10 per cent level. Both coefficients (−.0879 and −.1095) do have the expected negative sign and have t-statistics greater than unity. For female recipients, both the uncompensated wage effect and the substitution effect are virtually zero.

(b) ESTIMATES USING THE ACTUAL WAGE RATE, r

Table 4-6 presents the coefficients from the linear approximation and Table 4-7 the results from the regressions for the total differential specification.

The coefficients estimated to represent the income effect for males are significantly greater than zero at the 5 per cent level. For female recipients, the income effect is not significantly different from zero.

The uncompensated wage effect and the substitution effect are both negative, and the estimated effects for females are not significantly different from those estimated for males. When the sex-interaction term is dropped, as in column H in Table 4-7, the substitution term is estimated to be significantly less than zero at the 5 per cent level.

(c) ESTIMATION OF THE ELASTICITIES

Table 4-8 presents the substitution and income elasticities calculated at the mean values of the after-tax wage rate, income, and duration variables. The estimates of the income elasticity for male recipients are all generated from significant coefficients and fall between .8 and 1.5. The only substitution elasticity estimated from a significant coefficient is computed to be −.7392. The other estimates range between −.7 and −1.6.

For female recipients, the income elasticity is estimated to be zero and the substitution elasticity is estimated to be between zero and −.5. Only one of the elasticities was estimated from a coefficient significantly different from zero at the 10 per cent level.

The substitution elasticities estimated for male recipients from the specification using the actual wage rate were obviously, but not significantly, different from those estimated from the specification using a potential wage rate. The estimates for the male income elasticity and the female elasticities from the two specifications were similar.

TABLE 4-3:

Means of the Variables Used in the Fully Employed Regressions and in the Calculation of the Income and Substitution Elasticities

Variable	*Male*	*Female*
(1) Y	$422.31	$326.88
(2) Y_v	303.42	238.71
(3) $(1-t)\bar{r}$	154.75	124.60
(4) $(1-t)r$	154.70	124.57
(5) G	268.96	204.56
(6) D(Months)	12.41	20.40
(7) H(Percentage)	100.0%	100.0%

TABLE 4-4:

Duration Regression Results Using Potential Wage Rates for the Fully Employed Recipients—Linear Approximation

	Dependent Variable =	Duration of Assistance in Months
Independent Variable	*A*	*B*
Constant	8.89	3.52
	(.84)	(.40)
Female	11.19	23.02
	(.79)	(4.27)
Age		
Under 20	5.30	5.54
	(.36)	(.37)

Independent Variable	*A*	*B*
20 to 24	-7.81	-8.16
	(2.55)	(2.63)
25 to 34	Omitted	Omitted
	—	—
35 to 44	7.10	7.48
	(3.41)	(3.67)
45 to 59	9.02	9.28
	(3.95)	(4.09)
60 and older	4.81	4.51
	(.59)	(.55)
$\hat{r}^*$	-.0879	-.0505
	(1.26)	(.89)
$\hat{r}^* \times F$	.0931	Omitted
	(.91)	—
G	.0427	.0403
	(2.99)	(2.87)
G x F	-.0573	-.0532
	(2.59)	(2.45)
R^2	.0985	.0974
Number of Observations	750	750

TABLE 4-5:
Duration Regression Results Using Potential Wage Rates for the Fully Employed Recipients— Total Differential Approach.

	Dependent Variable =	Duration of Assistance in Months
Independent Variable	*C*	*D*
Constant	11.66	4.61
	(1.11)	(.53)
Female	10.59	25.71
	(.75)	(3.80)
Age		
Under 20	4.69	4.98
	(.32)	(.33)
20 to 24	-8.10	-8.53
	(2.64)	(2.80)
25 to 34	Omitted	Omitted
	—	—
35 to 44	6.98	7.52
	(3.34)	(3.68)
45 to 59	8.90	9.31
	(3.38)	(4.10)
60 and older	2.54	2.42
	(.31)	(.30)
$\hat{r}^*$	-.1095	-.0551
	(1.49)	(.95)
$\hat{r}^* \times F$	.1293	Omitted
	(1.21)	—
$G + (1-t_i)Y_{TAX} + R$	.0288	.0248
	(2.50)	(2.24)
$[G + (1-t_i)Y_{TAX} + R] \times F$	-.0499	-.0425
	(2.62)	(2.36)
R^2	.0965	.0947
Number of Observations	750	750

TABLE 4-6:
Duration Regression Results Using Actual Wage Rates for the Fully Employed Recipients— Linear Approximation.

	Dependent Variable =	Duration of Assistance in Months
Independent Variable	*E*	*F*
Constant	-1.77	.10
	(.37)	(.02)
Female	30.10	23.86
	(4.15)	(4.55)
Age		
Under 20	5.83	5.51
	(.39)	(.37)
20 to 24	-8.19	-7.94
	(2.71)	(2.63)
25 to 34	Omitted	Omitted
	—	—
35 to 44	7.17	7.16
	(3.84)	(3.84)
45 to 59	9.07	9.13
	(4.06)	(4.09)
60 and older	3.66	5.04
	(.45)	(.62)
r^*	-.0154	-.0331
	(.59)	(1.50)
$r^* \times F$	-.0597	Omitted
	(1.25)	—

Independent Variable	*E*	*F*
G	.0405	.0436
	(2.80)	(3.05)
G x F	-.0465	-.0540
	(2.07)	(2.49)
R^2	.1010	.0991
Number of Observations	750	750

TABLE 4-7:
Duration Regression Results Using Actual Wage Rates for the Fully Employed Recipients— Total Differential Approach

	Dependent Variable =	Duration of Assistance in Months
Independent Variable	*G*	*H*
Constant	-.73	-.51
	(.15)	(.11)
Female	29.13	28.18
	(3.99)	(4.21)
Age		
Under 20	5.89	5.81
	(.40)	(.39)
20 to 24	-8.22	-8.19
	(2.72)	(2.72)
25 to 34	Omitted	Omitted
	—	—
35 to 44	7.19	7.18
	(3.85)	(3.85)
45 to 59	9.18	9.15
	(4.11)	(4.11)
60 and older	3.17	3.41
	(.39)	(.42)
r^*	-.0527	-.0593
	(1.55)	(2.17)
$r^* \times F$	-.0187	Omitted
	(.33)	—
$G + (1-t_i)Y_{TAX} + R$	.0369	.0388
	(2.56)	(2.96)
$[G + (1-t_i)Y_{TAX} + R] \times F$	-.0423	-.0466
	(1.89)	(2.57)
R^2	.0995	.0993
Number of Observations	750	750

TABLE 4-8:
Substitution and Income Elasticities for Fully Employed Recipients[1]

(1) SPECIFICATION USING POTENTIAL WAGE RATES

	Substitution Elasticity $\frac{\partial D}{\partial \hat{r}^*} \frac{\bar{r}^*}{\bar{D}}$	Income Elasticity $\frac{\partial D}{\partial Y} \frac{\bar{Y}}{\bar{D}}$
(i) Males		
Equation		
A	-1.6286	1.4524
B	-1.1313	1.3703
C	-1.3658	.9815
D	- .6869	.8428
(ii) Females		
Equation		
A	0	0
B	- .3083	0
C	0	0
D	- .3366	0

(2) SPECIFICATION USING ACTUAL WAGE RATES

	Substitution Elasticity $\frac{\partial D}{\partial r^*} \frac{\bar{r}^*}{\bar{D}}$	Income Elasticity $\frac{\partial D}{\partial Y} \frac{\bar{Y}}{\bar{D}}$
(i) Males		
Equation		
E	-.6980	1.3794
F	-.9568	1.4839
G	-.6570	1.2554
H	-.7392	1.3210
(ii) Females		
Equation		
E	-.4590	0
F	-.2024	0
G	-.4363	0
H	-.3622	0

2. PARTLY EMPLOYED RECIPIENTS

For the sample of partly employed recipients, the total differential specification is estimated by two stage least squares since it is hypothesized that the fixed income variable, $[G + (1-t_i)Y_{TAX} + R]$, and the disturbance term are correlated. In the first stage, the exogenous variables in the system are used to develop an instrumental variable which will be used as an estimate of $[G + (1-t_i)Y_{TAX} + R]$ in the duration regressions run in the second stage.[2] Age and age-sex interaction variables are included in the regressions, and both sets of variables contributed significantly to the explanation. Race, education, and location of residence variables were entered and found to be insignificant. Table 4-9 presents the means of the important variables.

Table 4-10 presents the regression results from the linear approximation and Table 4-11 presents the coefficients estimated by two stage least squares for the total differential specification. For both specifications, sex-interaction variables were included to facilitate the estimation of different income and substitution effects for males and females (column A in Table 4-10 and column C in Table 4-11). The coefficients for females were never significantly different from the coefficients for males, so they were constrained to be identical by eliminating the interaction variables. The results in columns B and D illustrate that the income effect is significantly greater than zero at the 5 per cent level. Both the uncompensated wage effect and the substitution effect are significantly less than zero at the 5 per cent level.

The income and substitution elasticities calculated at the mean are presented in Table 4-12. All the elasticities are calculated from coefficients significant at the 5 per cent level. The male income elasticity is between .3 and .5 and the substitution elasticity is between -1.5 and -1.7. For female recipients, the income elasticity is estimated to be from .2 and .5, and the substitution elasticity from -1.2 to -1.4.

TABLE 4-9:
Means of the Variables Used in the Partly Employed Regressions and in the Calculation of the Income and Substitution Elasticities

Variable	*Male*	*Female*
(1) Y	$288.26	$260.38
(2) Y_e	106.86	101.78
(3) $(1-t)\hat{r}$	141.01	120.66
(4) G	262.34	229.90
(5) D(Months)	17.01	17.92
(6) H(Percentage)	39.0%	44.2%

TABLE 4-10:
Duration Regression Results for the Partly Employed Recipients—Linear Approximation

	Dependent Variable =	Duration of Assistance in Months
Independent Variable	*A*	*B*
Constant	25.11 (3.74)	25.35 (4.03)
Female	6.49 (.40)	4.84 (1.52)
Age		
Under 20	-.49 (.08)	-.41 (.07)
[Under 20] x F	-5.70 (.62)	-5.84 (.66)
20 to 24	-3.08 (.89)	-3.07 (.89)
[20 to 24] x F	-7.47 (1.39)	-7.43 (1.45)
25 to 34	Omitted —	Omitted —
35 to 44	7.52 (2.71)	7.53 (2.75)
[35 to 44] x F	3.35 (.73)	3.12 (.75)
45 to 59	13.64 (5.10)	13.64 (5.12)
[45 to 59] x F	3.38 (.73)	3.29 (.73)
60 and older	17.26 (4.62)	17.24 (4.63)
[60 and older] x F	-14.68 (1.82)	-14.51 (1.96)
$\hat{r}^*$	-.1730 (3.60)	-.1755 (3.94)
$\hat{r}^*$ x F	-.0164 (.13)	Omitted —
G	.0290 (3.03)	.0293 (3.62)

Independent Variable	*A*	*B*
G x F	.0013	Omitted
	(.07)	—
R^2	.1543	.1542
Number of Observations	865	865

TABLE 4-11:

Duration Regression Results for the Partly Employed Recipients—Total Differential Approach Using Two Stage Least Square.

	Dependent Variable =	Duration of Assistance in Months
Independent Variable	*C*	*D*
Constant	30.29	32.36
	(3.17)	(3.77)
Female	10.52	3.89
	(.52)	(1.11)
Age		
Under 20	.35	-2.05
	(.05)	(.34)
[Under 20] x F	-14.97	-5.42
	(.95)	(.61)
20 to 24	-3.09	-3.95
	(.83)	(1.13)
[20 to 24] x F	-12.28	-7.67
	(1.49)	(1.50)
25 to 34	Omitted	Omitted
	—	—
35 to 44	7.26	7.99
	(2.43)	(2.89)
[35 to 44] x F	1.67	3.03
	(.34)	(.71)
45 to 59	12.88	13.53
	(4.41)	(4.96)
[45 to 59] x F	-2.02	2.47
	(.27)	(.53)
60 and older	15.96	15.75
	(4.03)	(4.04)
[60 and older] x F	-21.68	-15.09
	(1.78)	(2.02)
$\hat{r}^*$	-.2179	-.2057
	(3.12)	(3.38)
$\hat{r}^*$ x F	.1054	Omitted
	(.56)	—
R^2	.1283	.1482
Number of Observations	865	865

TABLE 4-12:

Substitution and Income Elasticities for Partly Employed Recipients.[3]

	Substitution Elasticity	Income Elasticity
	$\frac{\partial D}{\partial \hat{r}^*} \frac{\bar{r}^*}{\bar{D}}$	$\frac{\partial D}{\partial Y} \frac{\bar{Y}}{\bar{D}}$
(i) Males		
Equation		
B	-1.5494	.4973
D	-1.7054	.3081
(ii) Females		
Equation		
B	-1.2681	.4263
D	-1.3845	.2641

3. UNEMPLOYED EMPLOYABLE RECIPIENTS

The total differential specification is estimated both by ordinary and by two stage least squares while the linear approximation is estimated by ordinary least squares. The age, age-sex interaction, and racial origin control variables were found to contribute significantly to the explanation of duration of assistance. Caucasian recipients have shorter durations of assistance than non-Caucasian recipients (mostly Indian and Metis). Location of residence and education were not significant explanatory variables. Table 4-13 presents the means of the variables.

The coefficients for the linear approximation regression are presented in Table 4-14. Column B of Table 4-15 presents the regression coefficients for the total differential specification when estimated by ordinary least squares. Columns C and D describe the results generated when two stage least squares are used. The income and substitution effects for both males and females are significantly different from zero and are of the expected sign. The ordinary least squares results suggest significantly higher effects for females than for males. When two stage least squares are used, the estimated effects for males and

females are not significantly different.

Estimates of the income and substitution elasticities are presented in Table 4-16. For males, the income elasticity is between .8 and 1.2 and the substitution elasticity is between -1.3 and -1.7. The female income elasticity is estimated between .4 and 1.8 with two of the estimates at about unity. Their substitution elasticity is between -2.3 and -3.5. Using ordinary least squares to estimate the total differential specification generates elasticities similar to those estimated from the linear specification. Rows A and B on Table 4-16 illustrate the similarity of these results.

TABLE 4-13:
Means of the Variables Used in the Unemployed Employable Regressions and in the Calculation of the Income and Substitution Elasticities.

Variable	*Male*	*Female*
(1) Y	$214.24	$102.25
(2) Y_e	14.55	6.83
(3) $(1-t)\bar{r}$	145.17	112.43
(4) G	210.30	100.30
(5) D(Months)	4.80	7.38
(6) H(Percentage)	5.14%	3.21%

TABLE 4-14:
Duration Regression Results for the Unemployed Employable Recipients—Linear Approximation

	Dependent Variable =	Duration of Assistance in Months
Independent Variable		*A*
Constant		6.32 (2.25)
Female		13.82 (1.70)
Caucasian		-1.86 (2.61)
Age		
Under 20		2.68 (1.93)
[Under 20] x F		-4.25 (1.44)
20 to 24		-.01 (.01)
[20 to 24] x F		-2.49 (.87)
25 to 24		Omitted —
35 to 44		3.02 (3.18)
[35 to 44] x F		.86 (.22)
45 to 59		4.21 (4.32)
[45 to 59] x F		11.75 (3.92)
60 and older		8.27 (4.20)
[60 and older] x F		-4.07 (.78)
$\hat{r}^*$		-.0424 (2.12)
$\hat{r}^*$ x F		-.1473 (2.13)
G		.0188 (5.24)
G x F		.0595 (3.54)
R^2		.1725
Number of Observations		1,048

TABLE 4-15:
Duration Regression Results for the Unemployed Employable Recipients—Total Differential Approach Using Both Ordinary Least Squares and Two Stage Least Squares.

	Dependent Variable =		Duration of Assistance in Months
Independent Variable	*OLSQ* *B*	*Instrumental Variables* *C*	*D*
Constant	6.42 (2.29)	7.18 (1.53)	5.61 (1.30)
Female	13.32 (1.64)	9.80 (.83)	16.87 (1.93)

Independent Variable	*OLSQ* B	*Instrumental Variables* C	D
Caucasian	-1.88	-2.00	-1.93
	(2.64)	(2.72)	(2.64)
Age			
Under 20	2.69	3.41	3.87
	(1.94)	(2.23)	(2.68)
[Under 20] x F	-3.90	-1.78	-7.94
	(1.32)	(.24)	(2.81)
20 to 24	.01	.19	.44
	(.01)	(.17)	(.41)
[20 to 24] x F	-2.19	-.82	-4.19
	(.77)	(.17)	(1.47)
25 to 34	Omitted	Omitted	Omitted
	—	—	—
35 to 44	3.01	2.95	2.82
	(3.17)	(3.00)	(2.90)
[35 to 44] x F	1.19	3.16	-.57
	(.30)	(.55)	(.15)
45 to 59	4.17	4.09	4.13
	(4.28)	(4.14)	(4.19)
[45 to 59] x F	11.56	13.11	10.13
	(3.87)	(2.94)	(3.40)
60 and older	8.16	8.17	8.46
	(4.15)	(3.95)	(4.14)
[60 and older] x F	-4.00	-3.45	-4.79
	(.76)	(.63)	(.91)
$\hat{r}^*$	-.0427	-.0550	-.0499
	(2.14)	(1.82)	(1.68)
$\hat{r}^* \times F$	-.1469	-.1727	-.0993
	(2.13)	(1.59)	(1.39)
$G + (1-t_i)Y_{TAX} + R$	.0183	.0233	.0265
	(5.23)	(4.17)	(6.19)
$[G + (1-t_i)Y_{TAX} + R] \times F$	.0607	.1072	Omitted
	(3.77)	(.90)	—
R^2	.1744	.1640	.1611
Number of Observations	1,048	1,048	1,048

TABLE 4-16:

Substitution and Income Elasticities for Unemployed Employable Recipients.[1]

Independent Variable	*OLSQ* B	*Instrumental Variables* C	D
(i) *Males*			
Equation			
A	-1.3112		.8404
B	-1.2919		.8170
C	-1.6645		1.0398
D	-1.5090		1.1836
(ii) *Females*			
Equation			
A	-2.9577		1.0853
B	-2.8880		1.0945
C	-3.4688		1.8091
D	-2.2721		.3676

4. MOTHER WITH DEPENDENT CHILD(REN) RECIPIENTS

Both ordinary least squares and two stage least squares are used to estimate the total differential specification. The age of the recipient was found to be significant while race, education, and location of residence were not significant explanatory variables in the duration regression. The means of the important variables are presented in Table 4-17.

Table 4-18 presents the regression coefficients from the linear specification and Table 4-19 presents the results from the total differential approach. In each specification, the income effect is significantly greater than zero at the 5 per cent level. When estimated by ordinary least squares, the uncompensated wage effect and substitution effect are negative and nearly significant at the 10 per cent level (column A in Table 4-18 and column B in Table 4-19). When estimated by two stage least squares, the coefficient describing the substitution effect in the total differential model is not significantly different from zero.

The income and substitution elasticities are presented in Table 4-20. Only the income elasticities are estimated from coefficients significantly different from zero at the 5 per cent level. As can be seen by comparing rows A and B, the ordinary least squares estimates of the two specifications generate similar elasticities. By this technique, the substitution elasticity is estimated at about -.63 and the income elasticity at .25.

Interpretation of the Results

1. CONSISTENCY WITH LABOR SUPPLY THEORY

Labor supply theory hypothesizes that recipients with high potential wage alternatives or with low guarantees from the welfare agency will choose to remain on

	Substitution Elasticity		Income Elasticity	
	$\frac{\partial D}{\partial \hat{r}^*}$	$\frac{\hat{r}^*}{\bar{D}}$	$\frac{\partial D}{\partial Y}$	$\frac{\bar{Y}}{\bar{D}}$

welfare for only a short period of time or will choose more work and hence be transferred from a low work to a high work category. None of the regression results for any of the samples contradict this hypothesis. The coefficients on the potential or actual wage variables are either significantly less than zero or not significantly different from zero. The coefficients on the fixed income variables are either significantly positive or insignificant. The regression coefficients are consistent with labor supply theory.

2. RELATIVE SIZES OF THE INCOME AND SUBSTITUTION ELASTICITIES

In order to determine whether current recipients will work more or less under new welfare regulations one must estimate the relative sensitivity of the recipients to changes in wage rates and guarantee levels. In two of the four samples analyzed (partly employed and unemployed employables), the substitution elasticity is substantially larger than the income elasticity. In the fully employed sample, the income elasticity is larger than the substitution elasticity for the males and smaller for the females. For the mother with dependent child(ren) sample, it is impossible to distinguish which of the elasticities is the larger.

On the assumption that the elasticities estimated describe labor supply phenomena, the relative sizes of the elasticities suggest that, over the four samples, a one per cent increase in after-tax wage rates will decrease the duration of welfare assistance more than a one per cent rise in the welfare guarantee will increase duration.

In Chapter V, examples of the effect of various wage and income changes on the average duration of assistance are presented. The absolute size of the elasticities is used to generate these examples.

TABLE 4-17:
Means of the Variables Used in the Mother with Dependent Child(ren) Regressions and in the Calculation of the Income and Substitution Elasticities.

Variable	*Mean*
(1) Y	$246.00
(2) Y_n	20.83
(3) $(1-t)\bar{r}$	117.23
(4) G	238.81
(5) D(Months)	26.74
(6) H(Percentage)	9.34%

TABLE 4-18:
Duration Regression Results for the Mother with Dependent Child(ren) Recipients— Linear Approximation.

	Dependent Variable = Duration of Assistance in Months
Independent Variable	*A*
Constant	28.70 (2.77)
Age	
Under 20	-9.55 (1.75)
20 to 24	-8.72 (2.82)
25 to 34	Omitted —
35 to 44	17.29 (6.07)
45 to 59	25.32 (9.12)
60 and older	36.99 (3.35)
$\hat{r}^*$	-.1439 (1.63)
G	.0289 (2.19)
R^2	.1456
Number of Observations	1,075

TABLE 4-19:
Duration Regression Results for the Mother with Dependent Child(ren) Recipients— Total Differential Approach Using Both Ordinary Least Squares and Two Stage Least Squares.

	Dependent Variable = Duration of Assistance in Months	
Independent Variable	*OLSQ B*	*Instrumental Variables C*
Constant	29.23 (2.83)	12.62 (.79)

Independent Variable	*OLSQ* *B*	*Instrumental Variables* *C*
Age		
Under 20	-9.67	-6.53
	(1.77)	(1.17)
20 to 24	-8.87	-6.05
	(2.87)	(1.79)
25 to 34	Omitted	Omitted
	—	—
35 to 44	17.30	15.03
	(6.07)	(4.63)
45 to 59	25.22	24.92
	(9.08)	(8.85)
60 and older	36.60	39.29
	(3.32)	(3.51)
$\hat{r}^*$	-.1448	-.0554
	(1.64)	(.41)
$G + (1-t_i)Y_{TAX} + R$	.0265	.0515
	(2.07)	(3.30)
R^2	.1452	.1410
Number of Observations	1,075	1,075

TABLE 4-20:
Substitution and Income Elasticities for Mother with Dependent Child(ren) Recipients.[3]

	Substitution Elasticity $\frac{\partial D}{\partial \hat{r}^*}\frac{\bar{r}^*}{\bar{D}}$	Income Elasticity $\frac{\partial D}{\partial Y}\frac{\bar{Y}}{\bar{D}}$
Equation		
A	-.6422	.2657
B	-.6342	.2436
C	-.2426	.4736

3. ALTERNATIVE HYPOTHESES

Since the duration pattern of the welfare recipients is consistent with the predictions from a labor supply model, the estimated elasticities can be used to anticipate the change in the amount of labor supplied by the current recipients if the welfare regulations are modified. The regression results may also, however, be consistent with other hypotheses that do not lead to the same policy conclusions.

The most difficult problem is to separate demand phenomena from supply phenomena. If the personal characteristics that imply high potential wage rates are also the characteristics in relatively greater demand on the labor market, the recipients with a low potential wage may experience longer durations than those recipients with a high potential wage. Demand forces rather than willingness to supply labor may be the factor establishing duration patterns. If the demand hypothesis is the correct one, policies increasing the potential after-tax wage rate by reducing the welfare tax rate may have no effect on the duration of assistance. In this study, all available information, such as age, race, and location of residence, were used in the regressions to act as partial controls for such demand phenomena. Only the age of the recipient was consistently significant. Information on the tightness of the labor markets for various types of labor and personal characteristics is required before the demand hypothesis can be accepted or rejected. Since few of the control variables that could have picked up demand forces were significant, there is no *a priori* reason to accept the demand hypothesis as an obvious alternative.

The regression results could also be misinterpreted if the number of children rather than the level of the welfare guarantee influences the duration pattern. Since the level of the guarantee is largely established by the number of children, the two variables are highly correlated. However, if the number of children is the decision variable, policy changes increasing the welfare guarantee per person may not influence the duration pattern. Other research results do not help determine the type of influence number of children will have on work effort. Research by Greenberg and Kosters and by Hausman suggest the number of children is directly rather than inversely related to the amount of work effort of low income and AFDC people.[6] Kalachek and Raines present contradictory evidence as they found that participation and hours and weeks of work were inversely related to the number of children.[7] Perhaps more important than other research results, the results in this study are not perfectly compatible with the theory that the number of children is the dominant force. First, it is less likely that the number of children will influence the male than the female recipient's decision to work. The results show, however, that the income or guarantee effect is often as high for male as for female recipients. Second, the largest income elasticity for females is recorded in the Unemployed employable category where, by definition, the females have no children. The variation in the guarantee level for this group of recipients is due to housing expenditures and location of residence. Even though the number of children has no influence over these females they reveal a substantial sensitivity to the level of fixed income. Both of these results suggest that the amount

of income guaranteed, rather than the number of children supported, is the dominant factor.

Summary and Conclusion

The duration pattern of Alberta welfare recipients is consistent with the predictions of a labor supply model. Potential wage rates are inversely related to duration and the level of the welfare guarantee is directly related to duration. In two of the four samples, the substitution elasticity is distinctly larger than the income elasticity. In the other two samples, it is not clear which elasticity is larger. In general, the implication is that the current welfare recipients are more sensitive to after-tax wage changes than to changes in the level of the welfare guarantee.

Several alternative hypotheses are supported by the regression results. This study can neither "disprove" nor present much evidence that contradicts these alternative hypotheses. The primary importance of this chapter is to illustrate how consistent the duration pattern is with the predictions of a labor supply model.

Chapter V

Summary and Policy Implications

The duration pattern of Alberta welfare recipients is consistent with the predictions of a static labor supply model. Duration of assistance is inversely related to the potential wage rate and directly related to the income guaranteed by the welfare system. A comparison of the income and substitution elasticities generated from the coefficients suggests, as indicated in Chapter IV, that the duration of assistance is more sensitive to changes in the after-tax wage rate than to changes in the guarantee level.

By proper manipulation of the welfare tax rate and the level of the income guarantee, policy makers should be able to expand the coverage of the welfare system and include greater work incentives without further reducing the willingness of current welfare recipients to work. In fact, the work effort of this group might increase if adequate work incentives were introduced into the system. Estimates of the effect on the average duration of assistance of various percentage decreases in the tax rate and dollar increases in the guarantee level are shown in Table 5-1. These limits to the expected changes in average duration were developed by using the high and low estimates of the income and substitution elasticities developed for each category of recipient in Chapter IV. In several categories, a particularly high or low estimate was not used in calculating the limits if it obviously differed from all the other estimates of the same elasticity.

This simple form of simulation requires the use of the absolute size of the two elasticities. Several difficulties in their use should be discussed before the results are presented. First, since the elasticities represent the expected responsiveness of the mean recipient, the example in Table 5-1 describes the expected behavior of the mean recipient under different income and wage conditions. Second, the incomplete form of the dependent variable used in the duration regressions implies that the size of the coefficients will be an estimate of the minimum responsiveness of the recipients to the wage and income variables. There is no *a priori* reason why the relative size of the elasticities would be different if we had a more complete dependent variable. Finally, the cross-section was taken during a period of reasonably high unemployment. This will influence the absolute size of the coefficients but, if the labor supply model is applicable, there is no reason why the relative magnitude of the two effects is dependent on the market conditions at the time of the sample. The absolute magnitude of the coefficients would certainly be smaller, however, if the sample had been taken during a period of lower unemployment.

Using the actual elasticities in a simulation does, therefore, generate numerous difficulties. The example is presented, nevertheless, because it illustrates the crucial point that the incentive to work generated by a lower tax rate can offset the disincentives introduced by higher guarantee levels. The important aspect of the example is not the magnitude of the duration changes in each cell of Table 5-1 but the way in which the two forces, i.e., the tax rate change and the guarantee change, counteract one another.

The results can be interpreted as follows: if the guarantee level were increased by $50.00 per month, with no change in the tax rate, the average duration of assistance for fully employed male recipients would increase by between 2.31 and 3.23 months. If the marginal tax rate were reduced by 30 per cent, with no change in the guarantee level, the average duration of assistance for this group of recipients would fall by between 2.42 and 4.84 months. If both a $50.00 increase in the guarantee level and a 30 per cent decrease in the tax rate were legislated, the average duration of assistance for fully employed male recipients would fall by between .11 and 1.61 months. The results for each category of recipient clearly illustrate that reductions in the welfare tax rate could offset the increases in duration that would occur if the guarantee level were increased.

The per-recipient cost of providing welfare could either increase or decrease if the guarantee level were increased. Given the current amount of work effort while on welfare, the cost per recipient would certainly increase. However, after greater incentives are built into the system, the work effort of those individuals who remain on welfare will increase, so, conceivably, the cost per recipient will fall. Even if the least desirable alternative, i.e., increasing per recipient costs, occurs, the total cost of providing welfare to the group of currently eligible recipients may fall since a shorter average duration of assistance implies that there would be fewer recipients at any given time. One would have to be extremely confident in the work incentive measures to suggest, however, that the total costs incurred on the current recipients would decrease sufficiently to cover the costs of providing assistance to the people who will become eligible under a new set of welfare regulations.

The results presented in Chapter II should serve as a warning that the conditions faced by the recipients cannot be altered simply by introducing new legislation. Work incentives will be increased only if the welfare tax rate enforced after changes in the legisla-

tion is lower than the rate currently enforced. The tax rate has been estimated to be between 60 and 80 per cent rather than 100 per cent as specified by the statutes. Given this looseness in the application of statutes, policy makers will have little control over the supply of labor by welfare recipients until they observe more carefully how the legislation they draft is enforced.

This study suggests that prudent alterations of the welfare regulations can increase the work effort of the current welfare population without substantial cost increases. The total impact on work effort of any modification of the welfare regulations cannot be predicted from this study, since individuals who would be made eligible by expanding the coverage are not included in the sample. A sample of all low income individuals must be analyzed in the labor supply framework if the net effect of any policy change is to be predicted. The results of any expansion of the welfare system, and not just the move to an overall guaranteed income program, depend on the impact that wage and income changes have on labor supply.

TABLE 5-1:

Limits of the Expected Change in the Average Duration of Assistance in Months Due to Combinations of Increases in the Welfare Guarantee and Decreases in the Welfare Tax Rate (for each category of recipient)

A. FULLY EMPLOYED RECIPIENTS

(i) Male

Percentage Decrease in the Tax Rate	Dollar Increase in the Guarantee Level			
	0	$10	$30	$50
0	0	.46 to .65	1.38 to 1.94	2.31 to 3.23
10	-.81 to -1.61	-.35 to -.96	.53 to .33	1.50 to 1.62
20	-1.61 to -3.23	-1.15 to -2.58	-.23 to -1.29	.70 to 0
30	-2.42 to -4.84	-1.96 to -4.19	-1.04 to -2.90	-.11 to -1.61

(ii) Female

Percentage Decrease in the Tax Rate	Dollar Increase in the Guarantee Level			
	0	$10	$30	$50
0	0	0	0	0
10	0 to -.82	0 to -.82	0 to -.82	0 to -.82
20	0 to -1.63	0 to -1.63	0 to -1.63	0 to -1.63
30	0 to -2.45	0 to -2.45	0 to -2.45	0 to -2.45

B. PARTLY EMPLOYED RECIPIENTS

(i) Male

Percentage Decrease in the Tax Rate	Dollar Increase in the Guarantee Level			
	0	$10	$30	$50
0	0	.20 to .32	.60 to .97	1.00 to 1.61
10	-2.63 to -2.91	-2.43 to -2.59	-2.03 to -1.94	-1.63 to -1.30
20	-5.27 to -5.82	-5.07 to -5.50	-4.67 to -4.85	-4.27 to -4.21
30	-7.91 to -8.73	-7.71 to -8.41	-7.31 to -7.76	-6.91 to -7.12

(ii) Female

Percentage Decrease in the Tax Rate	Dollar Increase in the Guarantee Level			
	0	$10	$30	$50
0	0	.20 to .34	.61 to 1.01	1.01 to 1.68
10	-2.24 to -2.47	-2.04 to -2.13	-1.63 to -1.46	-1.23 to -.79
20	-4.48 to -4.95	-4.28 to -4.61	-3.87 to -3.94	-3.47 to -3.27
30	-6.72 to -7.42	-6.52 to -7.08	-6.11 to -6.41	-5.71 to -5.74

C. UNEMPLOYED EMPLOYABLE RECIPIENTS

(i) Male

Percentage Decrease in the Tax Rate	Dollar Increase in the Guarantee Level			
	0	$10	$30	$50
0	0	.19 to .27	.56 to .81	.94 to 1.35
10	-.62 to -.80	-.43 to -.53	-.06 to -.01	.32 to .55
20	-1.24 to -1.59	-1.05 to -1.32	-.68 to -.78	-.30 to -.24

Percentage Decrease in the Tax Rate	Dollar Increase in the Guarantee Level			
	0	$10	$30	$50
30	-1.86 to -2.39	-1.67 to -2.12	-1.30 to -1.58	-.92 to -1.04

(ii) Female

Percentage Decrease in the Tax Rate	Dollar Increase in the Guarantee Level			
	0	$10	$30	$50
0	0	.74 to 1.33	2.21 to 3.99	3.69 to 6.64
10	-1.68 to -2.56	-.94 to -1.23	.53 to 1.43	2.01 to 4.08
20	-3.35 to -5.12	-2.61 to -3.79	-1.14 to -1.13	.34 to 1.52
30	-5.03 to -7.68	-4.29 to -6.35	-2.82 to -3.69	-1.34 to -1.04

D. MOTHER WITH DEPENDENT CHILD(REN) RECIPIENTS

Percentage Decrease in the Tax Rate	Dollar Increase in the Guarantee Level			
	0	$10	$30	$50
0	0	.27 to .52	.80 to 1.58	1.34 to 2.63
10	-.64 to -1.71	-.37 to -1.19	.16 to -.13	.70 to .92
20	-1.28 to -3.42	-1.01 to -2.90	-.48 to -1.84	.06 to -.79
30	-1.93 to -5.13	-1.66 to -4.61	-1.13 to -3.55	-.59 to -2.50

Footnotes

Chapter I

[1]Canada, Department of National Health and Welfare, *Income Security for Canadians,* Queen's Printer, Ottawa, 1970.

[2]The direction of the change in the amount of labor supplied by the newly eligible recipients is ambiguous when dynamic assumptions are introduced into the model. The availability of welfare income may alter the aspirations, health, taste for consumer goods, or productivity of the recipients and these factors may increase their willingness to supply more work in later periods. The total effect on work effort over a number of periods is, then, ambiguous even for the new recipients on welfare. This research, however, continues to use static assumptions in the analysis of the welfare recipients' work effort. The implications of introducing dynamic considerations into the work-leisure choice are discussed in Michael Jay Boskin, "The Negative Income Tax and the Supply of Work Effort," *National Tax Journal,* December 1967, Vol. XX, No. 4: 353-367, and John Conlisk, "Simple Dynamic Effects in Work-Leisure Choice: A Skeptical Comment on the Static Theory," *The Journal of Human Resources,* Summer 1968, Vol. III, No. 3: 324-326.

[3]In January, 1970, 5.2 per cent (or 1,352 cases) of the cases supported in Alberta by the Department of Social Development were categorized as Employed, Insufficient Income. Almost half of these cases were headed by a fully employed person. See J. D. Rowlatt, *A Descriptive Analysis of the Socio-Economic Characteristics of the Alberta Welfare Recipients,* unpublished report prepared for the Alberta Human Resources Research Council, February 1971, p. 12. (mimeo)

Chapter II

[1]James Tobin, "The Case for an Income Guarantee," *Public Interest,* Summer 1966, pp. 31-41. Milton Friedman, *Capitalism and Freedom,* The University of Chicago Press, 1965.

[2]Since 1967, the Federally sponsored AFDC program in the United States specifies a 66.7 per cent tax rate on earned income.

[3]The tax rates are calculated on the basis of *recorded* income. The failure to report income on the part of recipients would imply that the tax rates estimated in this chapter are too high.

[4]J. Heffernan, "Adequate Grants and Work Incentives in Public Assistance, Children's Allowance and Negative Tax Programs," 1969, unpublished paper prepared for the Institute for Research on Poverty.

[5]The term "earned income" is used to describe all income from sources other than the welfare system. Such types of income as alimony, support payments, interest, or rents are included in this category.

[6]Whether individuals with earned income between G and G + tR would be permitted to receive welfare depends upon the local welfare system or the individual caseworker. Excluding such cases from the system introduces a discontinuity into the specifications. R is usually so small that the question becomes trivial.

[7]Canada, Province of Alberta, Department of Public Welfare, *Manual of Regulation and Procedures*, January 1968, Part II, Public Assistance, 2.

[8]G must be estimated since we are testing the hypothesis that the tax rate, t, is less than unity. The subsidy would be equivalent to the guarantee level only for the recipients with no earned income.

[9]The estimates of equation (2.7a) are presented with t as a cubic function of Y_{TAX} for the fully employed but only as a quadratic function of Y_{TAX} for the other three samples. These are simply the forms that fit the best.

R was not included in the fully employed regressions because no recipients earned less than the amount of income exempted from taxation. The effect of this exemption on spendable income will be absorbed by the constant.

[10]To examine this point let us assume that actual housing expenditures (AHC) are positively correlated with taxable earned income (Y_{TAX}). The following relationship:

$$Y = G + (1-t)Y_{TAX} + R, \qquad (2.5)$$

is being estimated with G, the guarantee level, introduced in the form of a number of proxy variables. It is known that:

$$G = AHC + \text{other costs}.$$

The independent variables explaining G have been estimated from:

$$AHC = h(W) + \varepsilon_i^* \text{ and other costs} = g(Z) + U_i$$

Location, type and quality of housing were included in (W) and family size and structure were included in (Z). It was assumed that the terms, U_i and ε_i^*, were not correlated with Y_{TAX}.

If AHC is correlated with Y_{TAX}, ε_i^* actually represents the following:

$$\varepsilon_i^* = \phi Y_{TAX} + \varepsilon \qquad (2.9)$$

To get an unbiased estimate of the tax rate, ε_i^* should be included in the regression. The regressions described in Tables 2-2 and 2-3 exclude ε_i^*. If entered, the coefficient ε_i^* should equal unity. Excluding ε_i^* means that the estimate of the marginal tax rate is biased by an amount equal to the coefficient on Y_{TAX} in (2.9). The bias, ϕ, is the difference between the actual and estimated coefficients.

$$\phi = (1-t)^* - (1-t)$$

where

$(1-t)^*$ = coefficient on Y_{TAX} in the model omitting ε_i^*.

$(1-t)$ = actual coefficient on Y_{TAX}.

A good exposition of the problem is presented in Arthur S. Goldberger, *Econometric Theory*, John Wiley and Sons, New York, 1964, pp. 196-197 or H. Theil, *Economic Forecasts and Policy*, North-Holland Publishing Company, Amsterdam, 1961. pp. 212-215.

[11]An alternative approach is to estimate ϕ from:

$$AHC = h(W) + \phi Y_{TAX} + \varepsilon$$

The coefficient on Y_{TAX} is an estimate of the potential bias inherent in our earlier estimates due to the relationship between Y_{TAX} and actual housing costs. When this estimate was made, ϕ was found to be significantly greater than zero and equal to .085.

[12]A tax rate less than 100 per cent implies that a recipient's real income is increased by working. If some of this income gain is consumed in the form of better quality housing at a higher price, part of the gain from working is absorbed by the actual housing expenditure variable. If this behavior is picked up when AHC is included in the regression but not when the proxies are used, part of the "bias" in the estimate of t, actually represents real gains from earning income. If this occurs, the actual tax rate is between our "uncorrected" and "corrected" estimates of t.

[13]The increase may be due to coding errors, as the Department of Social Development introduced the computer system in August, 1969.

[14]J. Heffernan, *op. cit.*, p. 19.

Chapter III

[1]Less than 4 per cent of the wives of male welfare recipients bring any earned income into the family. See J. D. Rowlatt, *A Descriptive Analysis of the Socio-Economic Characteristics of the Alberta Welfare Recipients*,

unpublished report prepared for the Alberta Human Resources Research Council, February 1971, pp.87 and 136. (mimeo)

[2]Orley Ashenfelter, "Using Estimates of Income and Substitution Parameters to Predict the Work Incentive Effects of the Negative Income Tax: A Brief Exposition and Partial Survey," unpublished paper circulated in the Industrial Relations Section, Princeton University, November 1970, pp. 1-17. (mimeo) Marvin Kosters, "Effects of an Income Tax on Labour Supply," in Harberger and Bailey (ed.), *The Taxation of Income from Capital,* The Brookings Institution, 1969, pp. 301-324. David H. Greenberg and Marvin Kosters, *Income Guarantees and the Working Poor: The Effect of Income Maintenance Programs on the Hours of Work of Male Family Heads,* Rand Corporation, a report prepared for OEO, December 1970. Edward D. Kalachek and Frederic Q. Raines, "Labor Supply of Low Income Workers," The President's Commission on Income Maintenance Programs, *Technical Studies,* 1970, pp. 159-186. Robert Hall, "Wages, Income and Hours of Work in the U.S. Labor Force," working paper of the Department of Economics, M.I.T., August 1970, No. 62, pp. 1-128.

[3]Leonard J. Hausman, "The Impact of Welfare on the Work Effort of AFDC Mothers," The President's Commission on Income Maintenance Programs, *Technical Studies,* 1970, pp. 83-100.

[4]It is impossible to distinguish among home work time, time spent searching for a job, and leisure time.

Chapter IV

[1]The underlined elasticities were calculated from coefficients that are at least significant at the 10 per cent level. A zero value is shown where the relevant coefficient is not significantly different from zero and has an incorrect sign. The other elasticities were calculated from coefficients that have the expected sign but are not significant at the 10 per cent level.

[2]The exogenous variables used to develop the instrumental variable are the following: Male 1 adult, Male 2 adult, town, hamlet, rural area, six types of housing variables, above- and below-standard housing, and the number of children in three age categories. Tables 2-2 to 2-5 show how accurately this set of variables estimates $[G + (1-t_i)Y_{TAX} + R]$.

[3]All the elasticities for this sample were estimated from coefficients that are at least significant at the 10 per cent level.

[4]All the elasticities for this sample were estimated from coefficients that are at least significant at the 10 per cent level.

[5]The underlined elasticities were estimated from coefficients that are at least significant at the 10 per cent level.

[6]David H. Greenberg and Marvin Kosters, *Income Guarantees and the Working Poor: The Effect of Income Maintenance Programs on the Hours of Work of Male Family Heads,* Rand Corporation, a report prepared for OEO, December 1970, pp. 108-115. Leonard J. Hausman, "The Impact of Welfare on the Work Effort of AFDC Mothers," The President's Commission on Income Maintenance Programs, *Technical Studies,* 1970, pp. 173 and 177.

[7]Edward D. Kalachek and Frederic Q. Raines, "Labor Supply of Low Income Workers," The President's Commission on Income Maintenance Programs, *Technical Studies,* 1970, pp. 95-96.

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